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GAS JOURNAL
Established 1859 — Pioneer of the Gas Industry
Manufactured and Natural Gas

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for

HOUSE HEATING JOBS

Accurate Pilot Measurement
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Satisfactory
Maintenance cost, first cost, and general results in Manufactured or Natural Gases, High or Low Pressure

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of Our New No. 17 Manual?

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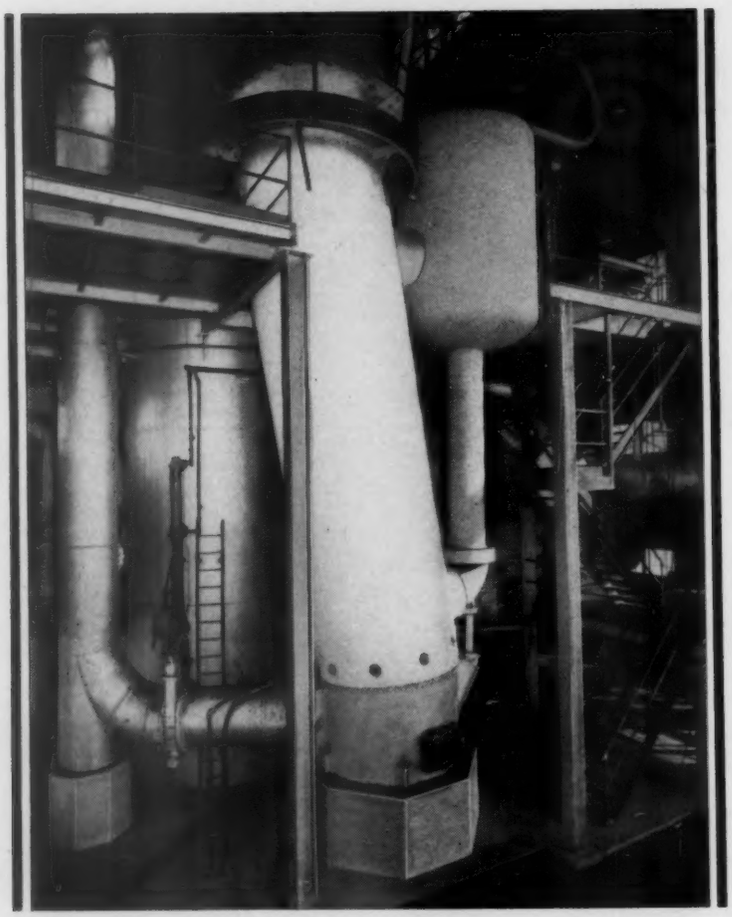
BRIDGEPORT, CONN.



U. G. I. Blast Gas Waste Heat Boiler Connected to U. G. I. Mechanical Generator Set at Shrewsbury, Mo.

THE

U. G. I. waste heat boiler

175 installations — 25 years experience

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AMERICAN
GAS JOURNAL
Established 1859 *Pioneer of the Gas Industry*

Manufactured and Natural Gas

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S. G. KRAKE, *President and Treasurer* A. M. GLEASON, *Secretary*

H. M. RILEY, *Editor*

R. S. McBRIDE, *Consulting Editor*, Washington, D. C.

Vol. 135, No. 6 December, 1931 Whole Number 3696

TABLE OF CONTENTS

Merry Christmas! 23
Humanity on the March 24
Plant Upkeep 24
Heat Conservation 24
Design of Gas-Compressor Stations—J. F. Hanst 25
Putting Waste Heat to Work in The Forge Shop—J. B. Nealey 30
Industrial Furnaces for Gas—L. E. Biemiller 33
Can You Remember When?—Frank P. Curley 36
Sound Proof Insulation for Natural Gas Piping—C. A. Philpott 37
Comfortable Homes 39
Dealer Cooperation in Oklahoma—W. B. Stoddard 40
Answering the Call 42
Motor Fuel from Natural Gas 43
American Gas Merchandising Almanack 45
The Pendulum Swings Back; or, Will You Be Ready by January 1? 46
Here's How 47
Joint Advertising Campaign Increases Public's Interest in Gas Appliances—Willis Parker 48
Butane Cooking School 49
International Coal Conference Discusses Fuel Competition 51
The Legal Side of Our Industry—Leo T. Parker 57
Equipment News 59
News of the Gas Industry 61
Book Review 64
Personals 66
Trade News 68

INDEX TO ADVERTISERS, PAGE 85

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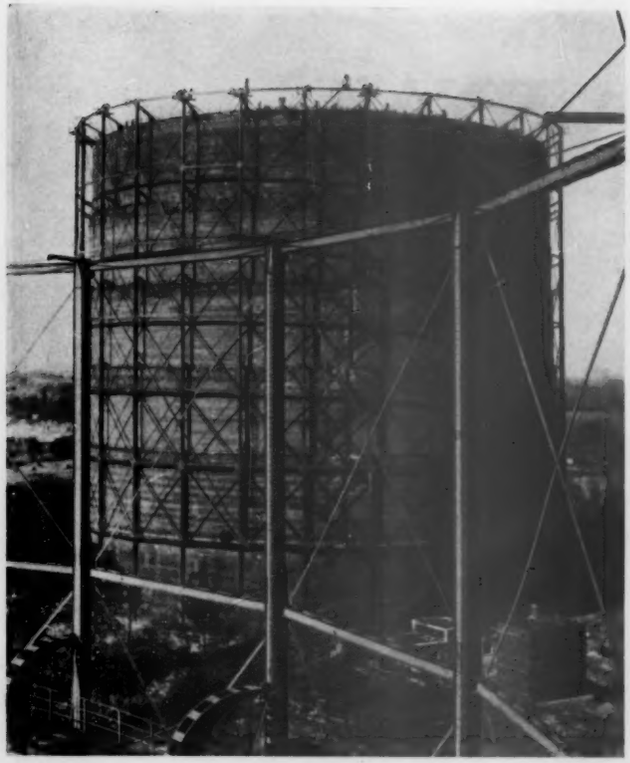


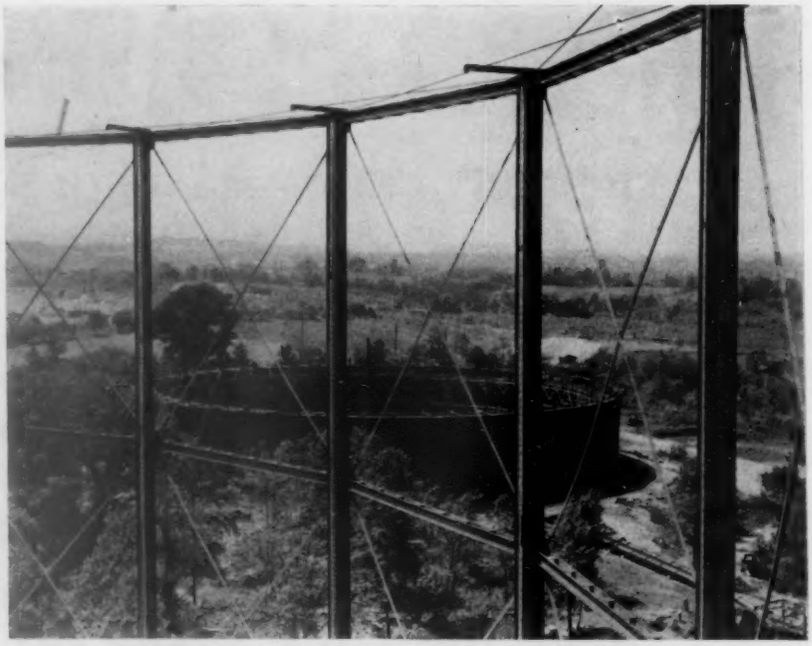
You see only *two* pictures of this brand new Holder? ... *Let us point out* three!

There's the new 10,000,000 cu. ft. Holder as it now is . . . and there's the Holder as it was a few months ago in the early stages of construction. Two pictures. Yet, we, the builders, and, we believe, every Cruse-Kemper man who helped with the design and erection, can look at this page and see three pictures. *For those who have shared in the building of this structure can see this Holder as it will be!*

The men who manned the giant bull riveters, the engineers who sketched and planned, the men who fitted the plates to an exactitude of minor fractions—they know the care that went into each step of construction.

It's axiomatic in Cruse-Kemper's work with steel plate construction, that the long life of any unit, long life with minimum annual upkeep and operating costs, can result only from extraordinary care.

Small wonder, then, that all who have contributed to this latest example of Cruse-Kemper's building, can look at the finished job and see years of the best of service ahead.



Both views from another Cruse-Kemper Holder built for the same purchaser some years ago.

Manufacturers of GAS HOLDERS and other major equipment units for the GAS INDUSTRY

CRUSE-KEMPER CO.

AMBLER, PA.

BUDGETING!

Extensions *Replacements* *Improvements*

This is the season when studies for plant expansions or changes are being made.

At this time annually, many organizations call upon us to assist in preparing outlines for study purposes. We offer the facilities of our entire organization—experienced in designing, constructing and operating—to aid you in selecting and laying out equipment that will meet today's need for economical, trouble-proof operation.

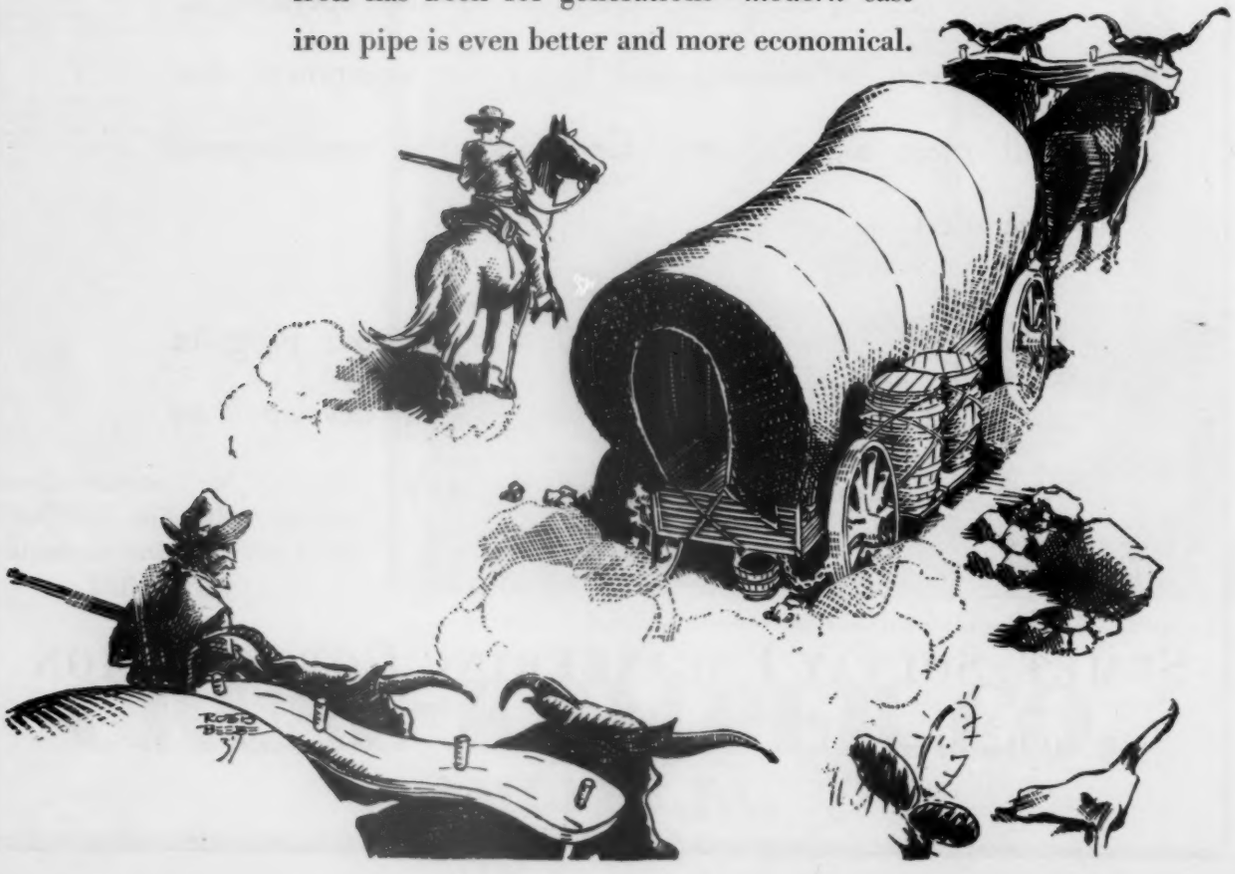
No matter how large or small may be your program for 1932, we are at your service to help develop it to your satisfaction. Please consult us freely.

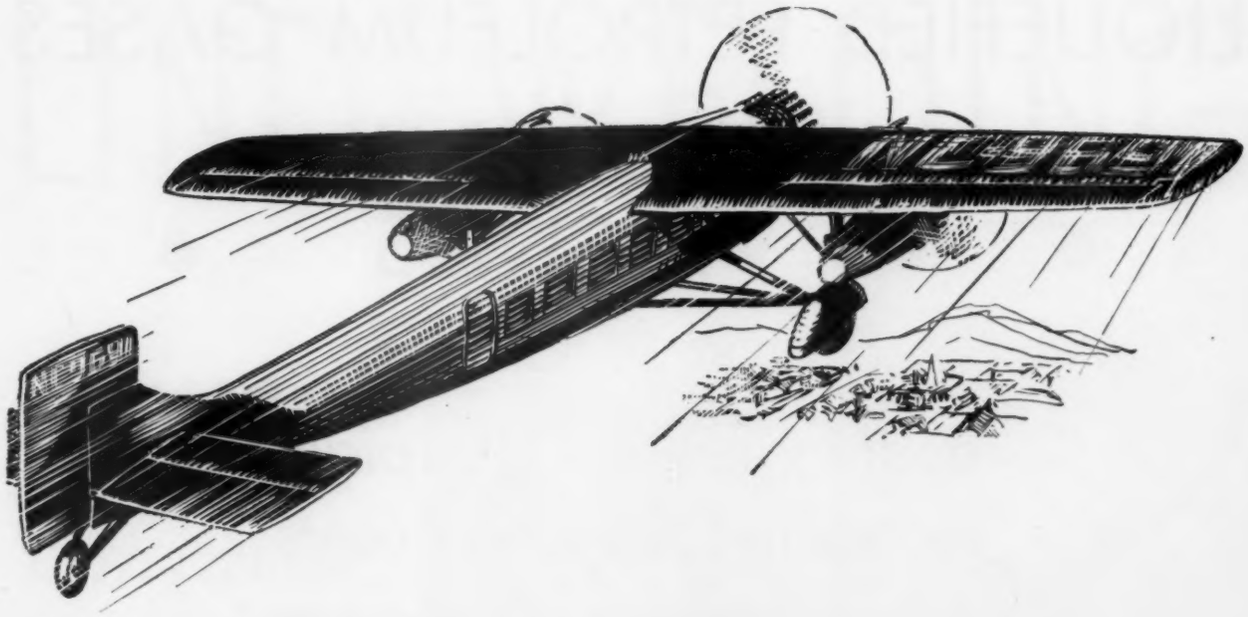
SEMET-SOLVAY ENGINEERING CORPORATION

40 Rector St. **New York, N. Y.**

CAST IRON GAS MAINS laid in Prairie Schooner Days Still Serve OMAHA

MANY an airplane passenger arriving at Omaha's fine municipal airport can remember back to 1884 when the Nebraska prairies were still traversed by wagon trains. In that year was laid the oldest recorded cast iron main still serving in Omaha's gas distribution system. Longer established cities can point to records of 80, 90 and 100 years of service from cast iron gas mains that are still serving satisfactorily. In fact, present day use of *original* mains is the rule rather than the exception. But—good as that oldtime pipe unquestionably was—economical as cast iron has been for generations—*modern* cast iron pipe is even better and more economical.





But Cast Iron Pipe produced today is even better

AS the gas and transportation industries have developed through the decades, so also has the cast iron pressure pipe industry. Modern cast iron pipe is produced under scientific laboratory control. Today the gas engineer is provided with cast iron pipe of higher and more uniform quality than ever before, remarkable as the quality of the oldtime product has been proved to be. With the development of efficient mechanical joints for high pressure service, the cast iron pressure pipe industry meets the modern requirements of gas distribution with a product which is specified with confidence and assurance. For information, address The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 Peoples Gas Building, Chicago, Ill.

Efficient mechanical joints for cast iron gas mains are now in use and obtainable for high-pressure gas distribution.

Cast iron pipe bearing the "Q-check" trademark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Corporation, 11 Broadway, New York.

Reg. Trade Mark

The "Q-check" symbol shown above is the registered trademark of The Cast Iron Pipe Research Association.

CAST IRON PIPE

LIQUEFIED PETROLEUM GASES

MAY EARN

DIVIDENDS

FOR YOU—

as they are for a rapidly increasing number of users

At the present time more than 100 communities are enjoying gas service by means of butane-air or undiluted propane plants. In addition, at least 150,000 consumers living beyond gas lines have been made gas users by means of "bottled" gas service. There are reasons for this steady growth!

Low fuel cost, ease of distribution, low investment required for gas conversion and utilization, flexibility and low operating cost, all make Liquefied Petroleum Gases worthy of your consideration for:

1. Gas Service Beyond Mains—for the "fringes".
2. Gas Manufacture—New franchises or conversion of existing plants.
3. Gas Enrichment—at low cost.
4. Peak Load Control—with small investment.
5. Standby Equipment—for uninterrupted service.

We will be glad to furnish data regarding Liquefied Petroleum Gases and their utilization.

GAS MANUFACTURING DIVISION

PHILGAS COMPANY

(FORMERLY PHILFUELS COMPANY)

(SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY)

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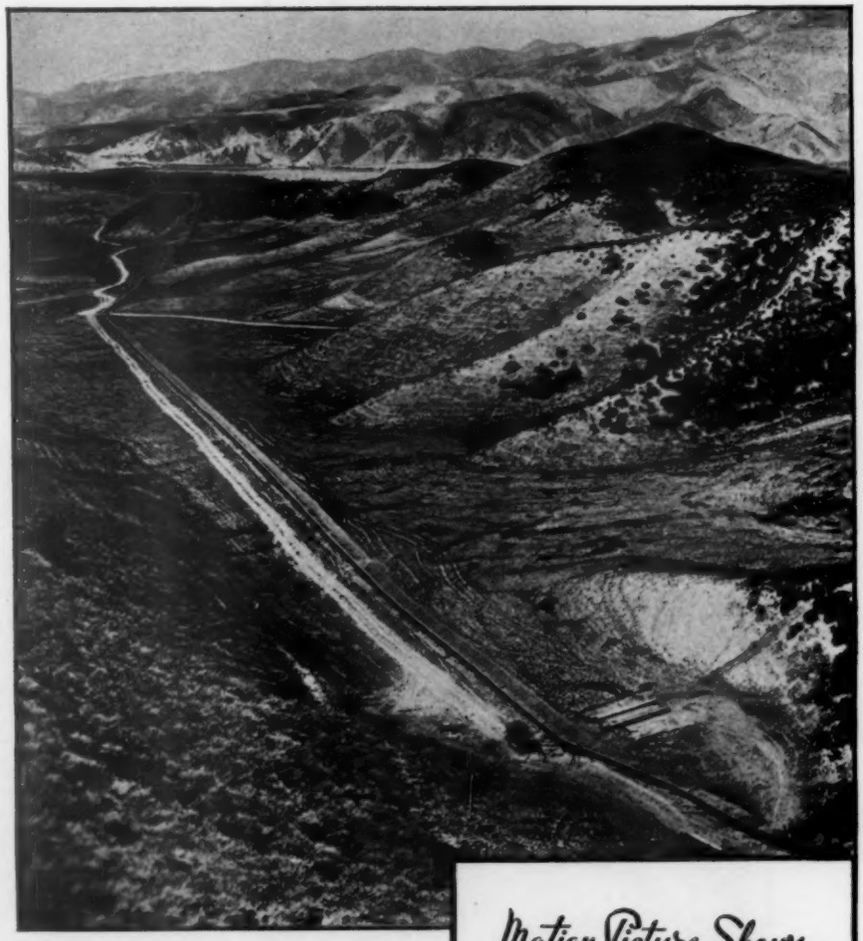
DETROIT -:- -:- MICHIGAN

LINDEWELDING

brings contractor more business



A contractor using Lindewelding on a 29-mile section of 8-inch oil line completed his part of the job so far ahead of schedule that the oil company gave him 51 additional miles to do.

Lindewelding means greater profits for any contractor because it makes high-strength joints 30 to 60 per cent. faster and with 35 to 40 per cent. less welding material.

Experienced welders quickly adapt themselves to this new method of oxy-acetylene welding, and beginners learn it more readily than other methods. It can be done with an ordinary blowpipe or with special apparatus which further increases speed by making the welding almost automatic.

Procedure Controls for Lindewelding are available to all users of Linde Oxygen. If faster welding, lower costs, and stronger joints would win more business and bigger profits for your company, ask our nearest district office for complete information today.

Motion Picture Shows details of Lindewelding

Lindewelding technique differs from neutral flame welding technique in that it employs a special rod, a special flame adjustment, and the "back-hand" method of blowpipe manipulation. The actual steps in making a Lindewelded joint are shown in our motion picture, "The Lindeweld Process for Pipe Line Construction." This picture will be loaned without charge to pipe line officials and welding or engineering societies. It is furnished in 16mm. and 35mm. safety film and can be obtained by writing to any Linde District Office.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants UCC 627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

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LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES • UNION CARBIDE

"The End of a Perfect Day"

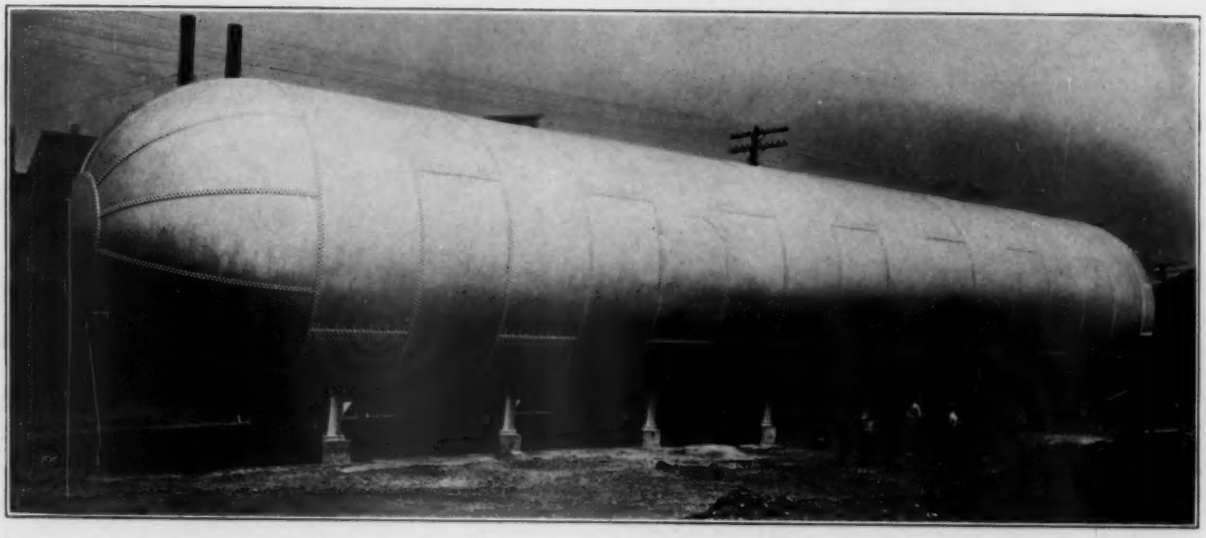
With Dresser Couplings a pipe line goes together in minimum time and stays together for maximum time—permanently tight. Everyone concerned with it, from first to last, has the ease and assurance that comes of using the best.

S. R. DRESSER MFG. COMPANY

Bradford Pennsylvania

DRESSER
COUPLINGS *Dominate!*

FOR HIGH PRESSURE NATURAL GAS STORAGE



SPECIFY THE "BULLET"

TO insure uninterrupted service to the many towns and cities now receiving natural and manufactured gas, specify the Stacey "Bullet."

This high pressure holder is needed at the ends of the branch lines to handle peak loads and pressure drops and to feed back when pressure falls due to line breaks or other causes.

The Stacey "Bullet," erected either vertically or horizontally, contains many points of especial economic interest to the industry. Write us now for complete details.

STACEY BROS. GAS CONSTRUCTION CO.
THE STACEY MANUFACTURING CO.

SUBSIDIARIES OF INTERNATIONAL-STACEY CORPORATION

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with the EMCO No. 4½ Pressed Steel Meter

SPACE REQUIREMENTS
45% less than equivalent tin meters.

SAFETY
pressed steel construction eliminates fire hazard and damage from external sources.

PROVEN PRINCIPLES
design and construction of the EMCO No. 4½ Meter is the same as in the EMCO No. 5; tried and proven, it meets the demand for accurate industrial measurement of Natural or Manufactured Gas.

BULLETIN No. 1018
tells the complete story. Write for it today.

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½ PRESSED
STEEL METER

Pittsburgh Equitable Meter Company
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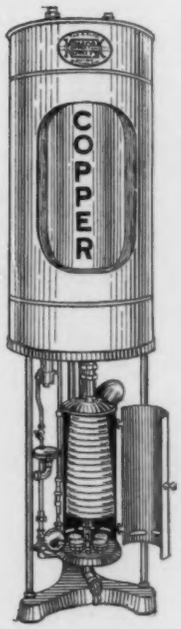
Why the KOMPAK Excels



The basic principles underlying the Kompak construction are based on sound engineering.

Lukewarm water is not *HOT WATER*—when you install a water heater the customer rightfully expects hot water *all* the time.

The Kompak delivers the water hot directly to the top of the tank. It will deliver more hot water than any heater made.

It is built of COPPER. It is economical and your customer is always satisfied.

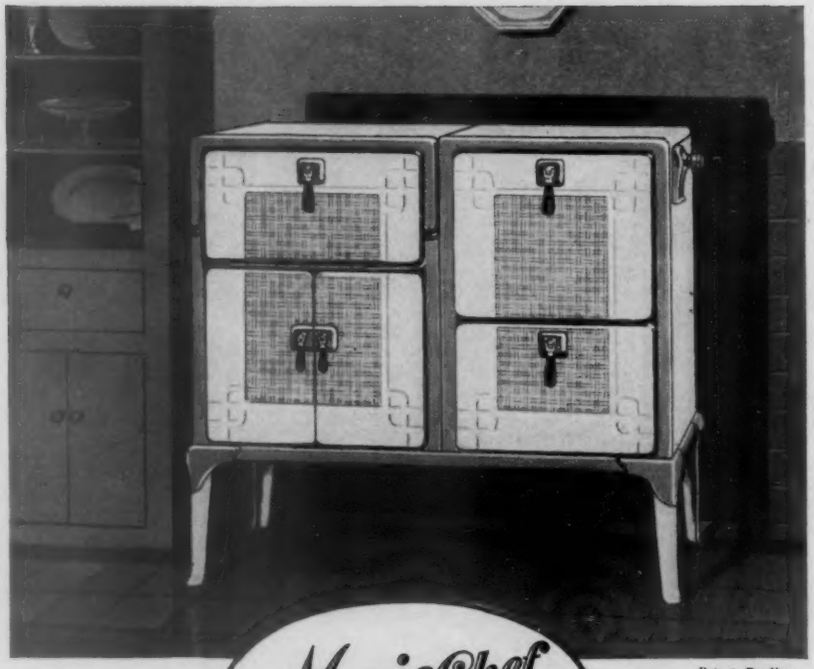
THE HEATER WITH
A COPPER TANK
GUARANTEED
20 YEARS.

THE KOMPAK CO.
Automatic Thermostatic Gas Water Heaters
NEW BRUNSWICK
NEW JERSEY

KOMPAK

The NEWEST MAGIC CHEF

SERIES 600



Patents Pending

In price and type of gas range, the Series 600 Magic Chef bridges the gap between the top of the line and the popular-priced Series 500.

This newest Magic Chef is extremely handsome and imposing in design and decoration. Its color scheme of Old Ivory with two tones of green for trim and panels of Cocoa-Brown basket weave is decidedly pleasing and will harmonize with every kitchen.

With ample cooking capacity for a large family, Magic Chef Series 600 is built for utmost convenience and efficiency.

Special features include the Red Wheel Lorain Oven Heat Regulator, three-in-one non-clogging top burners, Magic Chef top lighter, new type high burner tray, cabinet type cooking top cover which, when closed, conceals the manifold and protects gas valve handles against meddling, roomy service compartment with wide partitioned drawer, patented reversible broiler pan and fully insulated oven and broiler.

With the addition of Magic Chef Series 600, the Magic Chef dealer now has a complete line, nationally advertised, that satisfies every gas range buying requirement and provides every advantage needed to overcome competition.

Look For The RED WHEEL
When You Buy a MAGIC CHEF

AMERICAN STOVE COMPANY

World's Largest Manufacturer of Gas Ranges

NEW YORK · PHILADELPHIA · ATLANTA · CLEVELAND
CHICAGO · ST. LOUIS · LOS ANGELES · SAN FRANCISCO

AKRON FACED STRAIN, EXPERT LAUDS ACTIONS
Dr. Arnstein Says Dirigible Met Every Test in Magnificent Style.
By Dr. Karl Arnstein.
AKRON, O., Oct. 22.—(By A. P.)
—The U. S. S. Akron, accepted yesterday by th enavy, is an airworthy ship. That much we know from the test flights just completed. When the tests for strength were made in the dock before the trial flights, the ship was loaded down with tons of weight, until it seemed as though we were deliberately trying to break its back.
In the air it was made to dive and climb at speeds deemed dangerous in former practice.
The problem of the navy and the Goodyear-Zeppelin designers was to build a ship which in every particular would meet the stresses it might
The problem of maximum strength and minimum weight is ever present in airship building. The trick is to effect a nice balance between the two, then to check by meticulous tests, to see how closely you have hit it—and to resolve every doubt in favor of strength.
with such scientific precision, from stem to stern, top side to keel, the interior of the ship was literally dotted with curious gauges and recording instruments, many of them specially designed for this purpose. Even the seismograph used for detecting earthquakes, was utilized to measure vibration.
State Troopers Guard Edison Resting Place.
ORANGE, N.

Maximum Strength-Minimum Weight-

ELEVEN years ago the Cleveland Baby Digger solved a problem similar to that which confronted the designers of the "Akron"; providing Public Utilities with a capable, efficient trencher for City and Suburban work.

Although stripped of all unnecessary tonnage there was no compromise with ruggedness or strength.

The solution was found by combining a cleancut, modern, practical design with the finest and toughest of alloy steels.

From year to year the Baby Digger has kept pace with up-to-date engineering and metallurgical developments. Built throughout for maximum strength with minimum weight, this machine provides the utmost in flexibility and utility; coupled with ruggedness and tenacity in performance.

. . . and that's another concrete reason why "Clevelands" really save more money on more jobs.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

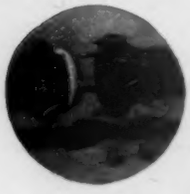
20100 ST. CLAIR AVENUE CLEVELAND, OHIO

The CLEVELAND BABY DIGGER

Foresight Demanded 12" & 16"
MONO-CAST DOUBLEX SIMPLEX CAST IRON PIPE for this important job!

(1) (2) (3)

Photo No. 1: **It's costly enough to have to tear up modern pavement for an initial installation; therefore it's just plain common sense to install pipe that will prevent a repetition of this expense.** ***Photos No. 2 and No. 3:*** **There will be no such expensive repetitions on this job. Twelve- and 16-inch Doublex Simplex Cast Iron Pipe is being installed. The pipe is *big enough* and *strong enough* to take care of future demands. It is made of mono-cast iron, therefore it will resist destruction by corrosion. It is equipped with the Doublex Simplex Joint, therefore the joints won't leak, even though the years may bring severe stresses due to ground movements. In other words, *size, the life of the pipe material itself, the efficiency of the joint*—all have been considered; Mono-Cast Doublex Simplex Cast Iron Pipe is being installed; therefore the installation will be *permanent*. You are interested in pipe that performs like this. Let us send you full details and quote you on your next pipe requirements.**



SIMPLICITY is the keynote of the Doublex Simplex Joint. Yet it is regularly carrying gas pressures in excess of 100 pounds and has been tested above 1000 pounds. Doublex Simplex Cast Iron Pipe bears the "Q-check" mark of the Cast Iron Pipe Research Association

MONO CAST Q IRON

AMERICAN
CAST IRON PIPE COMPANY

BIRMINGHAM, ALABAMA

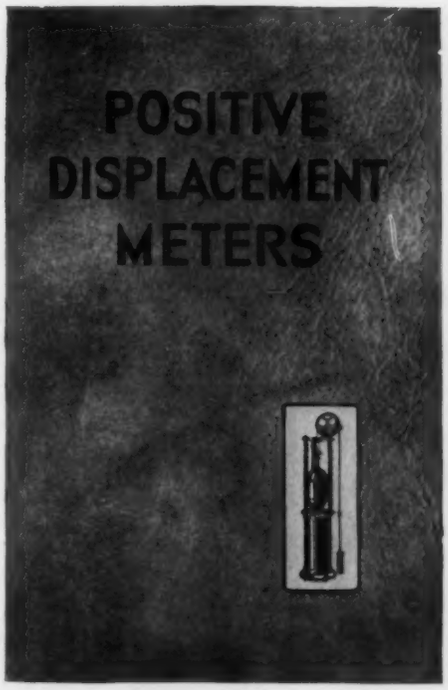
SAN FRANCISCO
DALLAS
NEW YORK CITY

CHICAGO
MINNEAPOLIS
SEATTLE

KANSAS CITY
LOS ANGELES
CLEVELAND

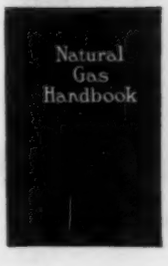
1231G

Constructive information is appreciated



HANDBOOK E-4 on displacement measurement is the most recent evidence of this company's desire to supply the industry with comprehensive information on gas measurement engineering. This book like its predecessors has been enthusiastically received as a constructive piece of information. You will agree with a few representative testimonials taken from hundreds of acknowledgments received since its publication in June, 1930.**"Please accept my sincere thanks for this most valuable book" . . . "a great deal of information which we could not secure elsewhere" . . . "a very valuable reference book in connection with all phases of gas meters" . . . "contains a mine of valuable information" **If you have not sent a request for the copy to which you are entitled as a member of the industry, please do so promptly. Free distribution is limited.

Since it was first published Handbook E-2 on Orifice Meters has been through several editions and is in continuous demand. Send for the free copy to which you are entitled as a user of orifice meters.



The Natural Gas Handbook (578 pages) compiled and edited by John C. Diehl has become the basic reference authority of the natural gas industry. Its practical usefulness is greatly enhanced by the 1927 revised edition. Prices and particulars upon request.

AMERICAN METER COMPANY
INCORPORATED
The World's Largest Manufacturers of Gas Meters and Allied Apparatus
ESTABLISHED 1836
GENERAL OFFICES : 105 W. 40TH STREET · NEW YORK, N.Y.

American Meter Company is headquarters for complete information on all phases of gas measurement. A complete chart of printed information is available on request.

DARLING VALVES

Pipe

for Lines

Darling Valves around the world

And well they might be! Thousands of miles of Pipe Lines—through arid desert heat and tropical wilderness, in many countries and in your community—are controlled by Darling Gate Valves.

Someone who **knew** has specified each one of these valves. It may have been last year or 10 years ago. Ask the man who depends upon them for long wear and efficient operation. We will furnish the particulars; he must sing the praise.

Darling Valve & Mfg. Company
WILLIAMSPORT, PA.

NEW YORK HOUSTON
OKLAHOMA CITY

DARLING
GATE VALVES

REYNOLDS manufactures a complete line of Gas Control Regulators. Each one in its line is designed and built to meet a specific requirement of the Gas Control field.

REYNOLDS NEW HIGH PRESSURE LINE REGULATOR

Recognized Gas Control Since 1892

CAREFUL BUYERS KNOW

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  422 Dwight Building
  KANSAS CITY, MO.
  2nd Unit, Santa Fe Bldg.
  DALLAS, TEXAS
- **REPRESENTATIVES**
  Eastern Appliance Co.
  Boston, Mass.
  F. E. Newberry, Avon, N.J.

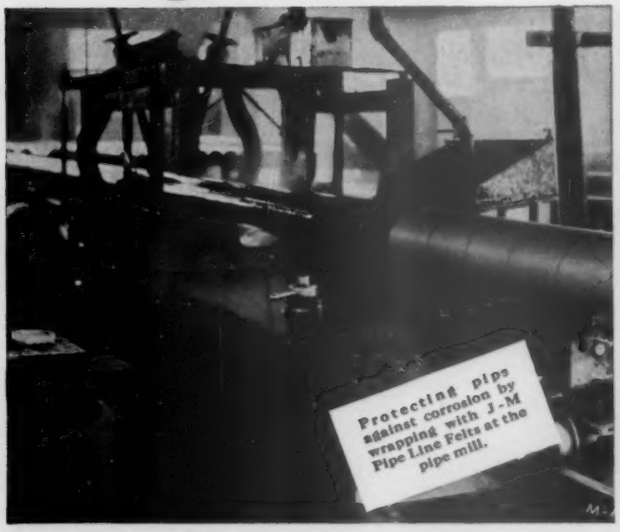
CORRECT PRINCIPLE, sound design, and dependable performance are just three of the many reasons why REYNOLDS Units enjoy preference on most specification sheets. These careful-buying gas executives also know that the unquestionable after-installation performance of every REYNOLDS Unit is backed by thirty-nine years of experience. And, too, they realize that the REYNOLDS cooperative policy is one too important to overlook. When your next Gas Control problem arises, call REYNOLDS —their engineers will be glad to work with you.

- **REYNOLDS PRODUCTS** for all kinds of Pressure Reductions—for either Artificial or Natural Gas.

GOVERNORS—Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street. **REGULATORS**—High Pressure Service, Low Pressure Service, Intermediate Pressure, High Pressure Line, Single and Double District Station. **VALVES**—Automatic Quick Closing Anti-Vacuum, Relief, Cut-Off. **SEALS**—Mercury and Dead Weight.

REYNOLDS GAS REGULATOR COMPANY
ANDERSON, INDIANA, U.S.A.

HERE IS *security* *against* PIPE-LINE *corrosion*



J-M ASBESTOS PIPE LINE FELTS

can be applied by hand or by machine at the mill, in the yard, or in the field

AT a fraction of the cost of reconditioning, this permanent protection is security against moisture penetration... soil stress... and electro-chemical action.

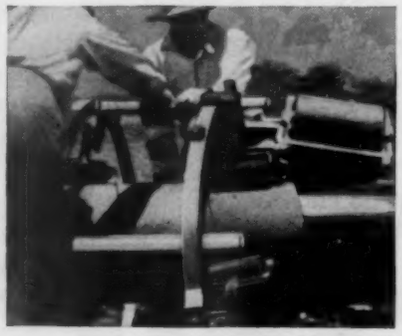
Asbestos Felts, because of their strength, immunity to rot and decay, and resistance to electrical and chemical action, have for many years provided the ideal reinforcement in all types of waterproofing construction.

Owners of more than 10,000 miles of pipe lines have purchased security against corrosion by incorporating J-M Asbestos Felt Wrapper in their pipe protection. The Asbestos Felt Wrapper adds to the waterproofing provided by the bitumen coating and successfully combats electrolytic and galvanic actions. It distributes the clod pressure and takes the shear and pull of soil action.

From the standpoint of better application and lower costs, we recommend wrapping by machine whenever possible. Mechanical wrapping applies the Asbestos Felts tightly and smoothly . . . with a uniform generous overlap.

Johns-Manville corps of engineers is especially qualified to discuss pipe-line protection. Get in touch with your local office or address Johns-Manville, 292 Madison Ave., New York City.

Our new booklet, "Safeguarding Your Pipe Line Investment," will be sent on request.



Wrapping over hot coating on a 16-inch welded line with rotary-type field machine.

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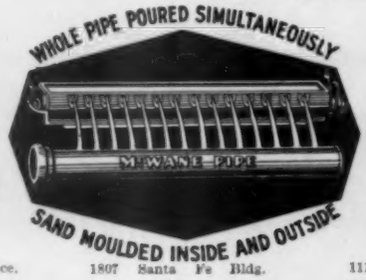

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AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including GAS INDUSTRY Est. 1900

HENRY M. RILEY, Editor

Merry Christmas!

WE CAN ALL remember how, in Dickens' Christmas Carol, old Scrooge berated his nephew for his show of Christmas spirit. Scrooge's nephew owed money and had not made particularly outstanding progress in business; therefore, why should he be so merry? And so, looking back over a year that has left its searing mark of adverse business on most of us, why should anyone elect to muster up a show of jollity? But hold, you Scrooges; remember that Jacob Marley's partner himself turned out to be the lustiest shouter of "Merry Christmas" extant.

Somehow the magic of Christmas, that great leavener of care and worry, infuses in all of us the hope of better things to come. Somehow it sponges off the dust of doubt and uncertainty from our glasses and they rightly assume their rosy hue. And may we as an industry that has also felt the blight of the business ebb, gather renewed strength from the spirit of the season. Better, may we carry the promise of happier times well into the new year, spreading far and wide a message of optimism to our customers and sister industries; may we materially assist in ameliorating unemployment conditions and lay bigger and better plans for service to the American nation. A finer gift could scarcely be conceived.

Out upon the Scrooges, say we! "With mirth and laughter let old wrinkles come!" A fine old industry, and every one else, we salute with the jolliest greeting ever — "Merry Christmas!"

*"God rest you, merry gentlemen,
Let nothing you dismay."*

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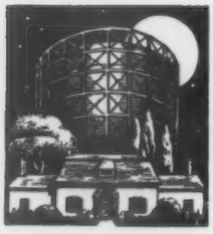
December
1931



As We See It

Humanity
On the March

THE RECENT JOURDAN PLAN for providing work for several hundred new men in the Brooklyn Union Gas Company calls for hearty commendation. The same goes for the other gas companies who are helping relieve the unemployment situation. And, although these companies are assuredly seeking no praise or laurels for this action, we can rest assured that they will receive much lasting credit and good-will, nevertheless.

Our industry has ever, by its inherent character, been very close to the people it serves. It has always been a very human sort of undertaking and although, down the years there have been minor defections here and there, they have been of the nature of family spats with both sides striving to reach a standpoint of equity. In the end then, the gas industry has always heeded the call of service—and so have its customers.

It is to be hoped that a number of other companies will emulate the fine example set by Brooklyn Union and the other companies that are providing work for the unemployed. For over nineteen centuries the question, "Am I my brother's keeper?", has recurred with proper frequency. Its affirmative answer, certainly by this country which has well earned the title of the World's Almoner, has had no small part in making America the powerful nation it is.

Humanity is on the march. Many will flock to the colors and, let it be hoped, the gas industry will constitute an important battalion in the great cause.

Plant
Upkeep

LIKE HUMAN BEINGS machines get sick, lose their pep and literally die. And sometimes, due to stupidity and indifference, they pass away entirely too early. We trust that not much of this is happening in the gas industry during the present business situation.

In treating personal ailments the medical profession has long preached the doctrine of preventive medicine. And financially speaking, it is a lot less expensive to prevent illness than it is to cure it. The same goes for the machine. Also, funerals are both grief provoking and costly.

Nearly two years ago, in answer to President Hoover's call the utilities laid out an ambitious program of repair and new construction. Much of this work, we believe, has been carried out; however, there should be no undue slackening of efforts in this direction. With our gas producing plants and distribution systems keyed up to a high efficiency we can in no wise afford to permit any falling off, due to degraded equipment.

Look over your entire operating equipment. Is that oven on its last legs? Does it need a bit of refurbishing? Do you recognize that the twins of high output and low materials input may well have their given names reversed through the medium of run down apparatus? How about that addition to your distribution system that will literally beautify your pressure charts? Is your testing laboratory "up to snuff" by way of modern instruments and equipment? What of that plant valve that you have packed and repacked until it is a fit subject for the scrap pile?

List your legitimate needs to keep your plant in a going condition—and try to see that these needs are satisfied. And bear in mind that safe working conditions go hand in hand with economical plant performance. "Eventually, why not now?" is a good slogan to go by and "now" is the time par excellence.

Heat
Conservation

ELSEWHERE IN THIS ISSUE will be found a most interesting account of savings effected by way of utilizing the waste heat from a gas fired forge to assist in generating steam for operating the steam forging hammer. Such a process, which comes under the general head of recuperation, is a step in the right direction and a more general application of the principle would go far to reduce gas costs in industrial operations.

Indeed, the adoption of this principle, as outlined in Mr. Nealey's article, has long had its counterpart in the steel plant. Those who are familiar with steel plant practice will readily recall the puddle furnace and the built-in steam boiler deriving heat for steam generation from the furnace.

The lesson we might derive from the article in question would seem to be concerned with a painstaking study of all those industrial operations where gas is being used and where the heat loss runs relatively high, to the end that much of the lost heat might ultimately be utilized in doing useful work and thereby raise the overall thermal efficiency. It would appear that any installation showing a flue loss of, say thirty percent or more, is worthy of such study.

Design of Gas-Compressor Stations

J. F. HANST

Associate Engineer, Ralph E. Davis, Inc.,
New York and Pittsburgh.

THE tremendous increase in the use of natural gas as a domestic and industrial fuel within the past decade, resulting in a network of pipe lines extending from every important gas field, has brought about a corresponding increase in the attention given to the design of compressor stations. A gas transportation system consists of pipe lines and the compressors which are necessary to keep the gas moving from the field to the market. In this article it is assumed that a pipe line has been properly designed for the amount of gas which it will have to transport, and that proper spacing of compressor stations, with the operating intake and discharge pressures necessary to be maintained at each location, have been properly determined. The writer will not attempt to enlarge on this phase of the subject, which has been ably covered by such eminent engineers as Rhodes and Hill, Davis and Terry, P. M. Biddison and others. Instead, let us consider the problems arising in the design of the compressor station itself.

In the early days of bringing natural gas to its market, very little attention was paid to proper design of stations, with some few notable exceptions. Stations "just grew," and all types and sizes of compressors found their way into some of the pioneer stations, but today this is not the case. Most companies have established a standard, and this standard is adhered to throughout the system.

Types of Compressor Drives

Compressors suitable for gas service are of various types. They may be belt driven by gas engine, steam engine, oil engine, or electric motor, or they may be direct connected to the same respective prime movers. They may be straight line units, with single or double acting power cylinders, and with compressor cylinders in tandem, or they may be duplex or "twin" units, with single or two-stage compressor cylinders, or any combination of these. At least one large manufacturer has brought out an electric-driven "four cornered" unit, having a duplex main frame with compressor cylinders on opposite ends of each half frame. There are also vertical multi-cylinder gas and oil engines available, with compressor cylinders mounted in place of what would normally be power cylinders, and there are angle types in which the power cylinders are vertical, while the compressor cylinders are placed horizontally. Finally, there has been developed a turbo-type unit driven by either a steam turbine or an electric motor which will handle very large quantities of gas at much higher pressures than were thought possible for this type machine a few years ago.

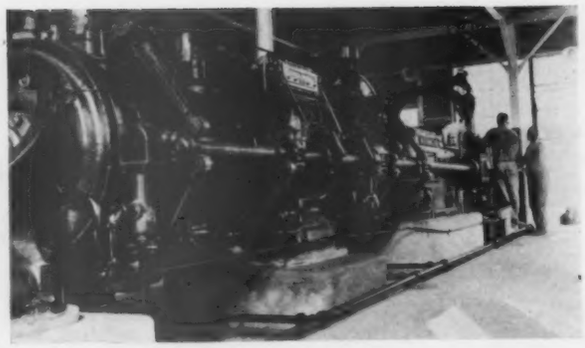
Factors Influencing Selection of Unit

Out of all the various types and sizes available, the first problem which the engineer must solve is to select units of a type and size which will satisfy the given operating conditions, and at the same time allow for some variation in these conditions. He must also bear in mind the possibilities of future expansion of the station, hence the units which he selects should be flexible enough to allow for changes in compressor cylinder size, or for increase in horsepower by the addition of power cylinders or by twinning the original units. Finally, the operating economy of the various types should be carefully considered. The units ultimately selected should therefore satisfy all of these conditions, with proper consideration being given to dependability and freedom from operating trouble over a reasonable length of time.

Belt-driven units—Belt-driven compressors for gas compression were among the first types to be used, but due to the enormous improvement in direct gas engine-driven types the belt-drive units are considered obsolete today. They are suitable for small installations only, with individual units not exceeding 165-200 H.P. How-

Typical small modern Compressor Station recently completed near Memphis, Tenn., showing main building, auxiliary building, pump houses, meter and regulator house and water tank.

ever, they possess certain advantages, particularly their flexibility, ease of transportation, freedom from operating troubles, and high dependability. First cost including compressor, belt, and driver, (electric motor, gas engine, oil engine, etc.) is about equal to a good direct-connected gas engine-driven unit of equivalent horsepower. The belted unit, unless short-belted or driven by one of the various types of V-belts, requires considerably more floor-space than the direct-connected type and consequently a larger building is generally necessary.



Type of 340 b.hp. direct connected gas engine driven Compressor Units installed in small Booster Station near Memphis. Looking toward Compressor end.

Steam-driven units—Steam-driven compressors are available in practically all sizes up to approximately 2000 H.P. Decision to use steam-driven compressors is usually based on a comparison of fuel costs, gas vs. coal, plus the consideration of flexibility. The fact that steam engines, as well as the boilers supplying the steam, are capable of operating for long periods at considerable overloads, while gas engines can not be so operated, often leads to a selection of steam-driven compressors, particularly where the intake and discharge pressures are subject to a wide variation. In general, the steam engine-equipped station is much more flexible than any other type, although standby losses and overhead expense may be slightly greater than for the gas engine-driven installation. Plenty of good water is an essential for the steam plant. The types of steam driven units in general use as gas compressors are the balanced piston-valve automatic cut-off type, the unaflow type, the full poppet-type, and the full Corliss-valve type. The piston-valve, unaflow, and poppet-type steam ends are suitable for high steam pressures and high superheats.

The full Corliss type is generally limited with regard to speed, pressure and superheat. It is not regarded as good practice to operate Corliss steam-ends of large size at steam pressures exceeding 200 lbs. per square inch or at superheats greater than 100°. The greatest economy with all types of steam units is secured of course, by running condensing, and very low steam consumption is obtainable in this manner. With a piston-valve, unaflow or poppet type, or a combination of these, steam rates as low as 10 pounds of steam per I.H.P. per hour may be obtained. With a Corliss unit the steam rate is slightly higher, on account of the limitations imposed, but nevertheless, very good economies are secured. The first cost of steam-driven units, compared with equivalent gas engine-driven units, is about half that of the latter. Large steam engine units can be purchased for $20.00 to $25.00 per I.H.P.,—as against $40.00 to $50.00 for gas engine-driven units of equivalent capacity. The cost of boilers, stokers, and all other equipment necessary for the steam driven station, however, makes the total cost of the complete station at least equal to the cost of a gas engine-driven station and this, coupled with the higher operating cost of the steam station, usually decides the engineer to select gas engine drive. If, however, the exhaust steam can be utilized for operating a gasoline plant in conjunction with the compressor station the balance is in its favor. At least one of the major companies operating in the Appalachian field has practically every one of its principal stations equipped with large steam-driven units. Two other major companies in the same field have about half of their principal stations so equipped.

Electric-driven units—Where conditions warrant, the direct-connected electric-driven type of compressor is highly desirable. Such compressors have long been standard in the industries as air compressors, consequently they have been developed to a high degree of efficiency. Their principal advantages lie in ease of control, ease of operation, freedom from operating trouble and comparatively small floor space required. They are not, however, capable of running for long periods at sustained overloads, and of course should not be installed in locations where the supply of power is unreliable. It is usually advisable, when considering an electric installation, to figure on the installation of gas engine-driven or oil engine-driven generators as standby units to be used in case of failure of the main supply of current. This feature runs the first cost of an electric installation somewhat above that of the gas engine-driven installation. Self-starting synchronous motors may be used on electric-driven gas compressors, but it is necessary to enclose the collector rings in a housing which is kept supplied with air at a pressure slightly above atmosphere, so that an explosive mixture of air and gas in the compressor room will not be permitted to reach the collector rings and be fired by a spark. The electric drive unit can be justified only when the cost of current is low compared with the cost of gas which would otherwise be used as fuel.

Oil engine-driven units—This type of compressor at the present time is not finding a very wide application. The only excuse for such a unit existing in a gas compressor station is that in a very few locations, the value of the gas is such that it is more profitable to market all of it than to burn any of it for fuel, whereas fuel oil may be purchased very cheaply. With the enormous supplies of natural gas now available in all parts of the country, it is not probable that oil engines will find more than an occasional application for gas compressor service. The first cost of such an installation is higher than any other type, although the operating cost may be very low.

Turbo-type units—Such compressors have heretofore been used only in steel mills, for supplying air to blast furnaces and convertors, and in industrial plants requiring large volumes of air at pressures not exceeding 100 pounds per square inch. The large turbo-*blowers* for blast furnace service operate at atmospheric intake and 15-35 pounds discharge and are capable of delivering, under these conditions, up to 100,000 cubic feet of free air per minute. Turbo-*compressors*, for industrial service, operate at atmospheric intake and 80-100 pounds discharge, and are capable of delivering up to 20,000 cubic feet of free air per minute. One very large public-utility company having extensive natural gas interests has recently purchased a compressor of this type for service on one of their gas lines. It is entirely too early to give any figures on the economy of operation, but it

is probable that if the unit performs as expected, it will tend to revolutionize the construction of compressor stations handling large volumes of gas. The advantages are obvious. For instance, a turbo unit can easily be built to utilize 8000 H.P. or more, whereas the largest practical gas engine driven units in use today average 1250 B.H.P. One such turbo unit, therefore, would take the place of six and a half reciprocating-type units, with a corresponding saving in floor space and other equipment. Such a turbo-compressor would cost in the neighborhood of $150,000.00, possibly more, but each 1250 H.P. reciprocating unit will cost approximately $60,000. There is therefore considerable saving in first cost on the units themselves, as well as on the station in general.

In the manufactured gas industry, low-pressure turbo-blowers, boosters, and exhausters have long been standard equipment, but in the natural gas industry, with the high operating pressures encountered, it has hitherto been thought impracticable to consider the turbo-type unit. Some of our most eminent engineers have persistently recommended its development for high-pressure service, but until recently have not been able to interest the manufacturers sufficiently to induce them to go ahead and build one. This has now been accomplished, and results will be watched with interest by all gas men.

Gas engine-driven units—At the present time, this type of unit has practically supplanted all other types for general compressor station service. With few exceptions, all such units operate on the four stroke cycle and are built on all sizes up to about 1500 H.P. Larger units are built for steel mill service, but as these are usually operated on blast furnace gas or coke oven gas, driving "blowing-tubs" for supplying air to blast furnaces, such units will not be considered here.

For the usual field station or line station, units of 1000 to 1250 B.H.P. each have now become practically standard. These are horizontal, double-acting twin-tandem engines, with compressors designed to meet given operating conditions. Smaller stations boosters on branch lines, pick-up stations in the field, etc., may be equipped with any type unit, vertical or horizontal, single or twin, depending upon conditions, but as a rule they have four-cycle power ends. Some manufacturers build two-cycle units equipped with a supercharging device which gives practically four-cycle economy. These units are preferred by many operators on account of their simplicity and general reliability. On the other hand, four-cycle units have been brought to such a high state of perfection by their builders, and most field men are so familiar with their operation, that this class of unit is generally preferred. The cost of such compressing units varies slightly with the size, small units up to 300 B.H.P. running about $50.00 per H.P. and larger units $40.00 to $45.00 per rated H.P. Each manufacturer naturally claims pre-eminence, but on the whole, there is very little difference in the fundamentals of all well-known makes of engines of similar type and characteristics. It is therefore up to the engineer to carefully examine all units offered and determine which, in his judgment, will best satisfy all conditions of operation and maintenance. *First cost should not generally be the major consideration.*

Computing Cylinder Dimensions

Having selected the size and type unit or units to be installed, the next step in the design of a compressor station is to determine the proper size compressor cylinders to be supplied. Usually it is perfectly safe to let the manufacturer say what size cylinders should be furnished for any given operating condition, and to specify what unloading equipment, if any, should be supplied with the cylinders. By unloading equipment is meant any device which is used in conjunction with the compressor cylinder to reduce the load at any predetermined point of operation. However, the engineer must satisfy himself that the manufacturer is not being unduly conservative or optimistic as to the performance of his particular units, and should therefore be able to check the manufacturer by computations of his own.

The fundamental equation of a perfect gas, expressed in terms of adiabatic compression, is $PV^n = K$, in which P = absolute pressure, V = total volume in cubic feet, n = the exponent obtained by dividing the specific heat at constant pressure by the specific heat at constant volume, and K = a constant. For natural gas $n = \frac{.5866}{.4457} = 1.315$. This is based on dry natural gas of specific gravity .6243 (air = 1). The theoretical indicated mean effective pressure (M.e.p.), considering the compression to be adiabatic, derived from the formula just given and from an ideal indicator diagram, is as follows:

$$\text{M.e.p.} = \frac{n}{n-1} P_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} - 1 \right]$$

In this formula, P_1 = absolute intake pressure and P_2 = absolute discharge pressure. The relation of P_2 to P_1 is the ratio of compression, usually designated by R. Substituting the value of n = 1.315 for dry natural gas in the formula, we obtain

$$\text{M.e.p.} = \frac{1.315}{.315} P_1 \left(R^{\frac{.315}{1.315}} - 1 \right) = 4.175\, P_1 (R^{.2395} - 1)$$

If n = 1.262, which is the value for pure methane of .5527 sp. gr., the value for M.e.p. then becomes $4.817\, P_1 (R^{.2076} - 1)$. Similarly, for any other value of n, the values change accordingly. Since the value of n for natural gas is taken at 1.262 by some engineers it is well to note that this gives a result about 1.79% less than that obtained by using n = 1.315.

It is also advisable to note that for computations involving any gas, the value of n varies with the character of the gas. As previously stated, for dry natural gas of average composition n = 1.315; for pure methane n = 1.262; while for "wet" gas, containing a high percentage of condensable constituents, the value of n is customarily taken as 1.1. It is well, therefore, to obtain an accurate analysis of the gas to be compressed before attempting to check any computations involving horsepower or capacity of a compressor cylinder.

The effect of temperature is omitted from the formula, since it is assumed that the gas will be measured at standard conditions of 60° F suction temperature and 29.33 inches of mercury. This corresponds to an atmospheric pressure of 14.4 pounds absolute. The horsepower and capacity calculations obtained by the use of the given formulas are correct for all practical purposes up to approximately 1000 feet above sea-level. For any higher altitude, a correction must be made.

Having determined the M.e.p. we may now substitute it in the well-known formula for indicated horsepower, which is $\text{I.H.P.} = \frac{\text{M.e.p. LAN}}{33000}$, in which L is length of stroke in feet, A = *net* area of piston in square

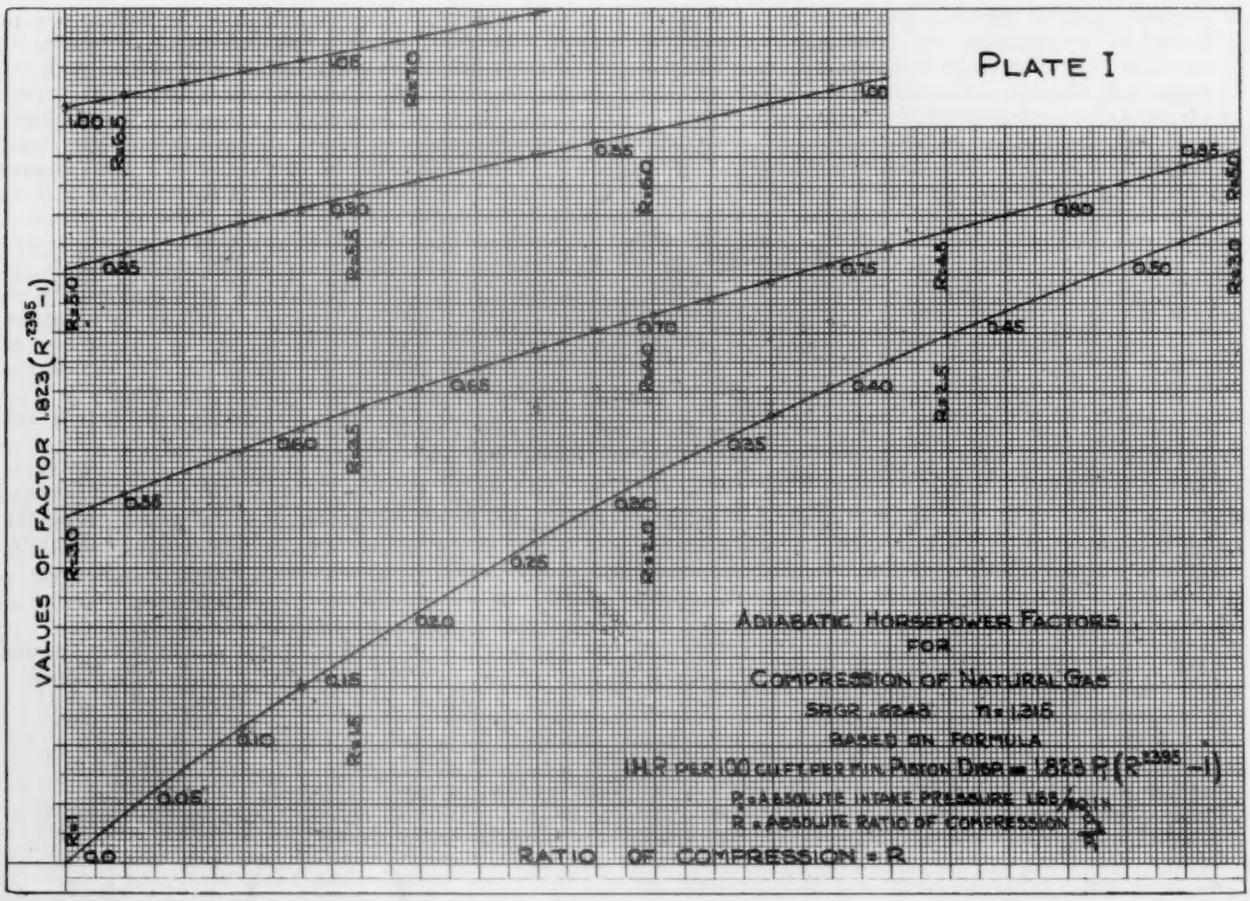


PLATE I
VALUES OF FACTOR 1.823 ($R^{.2395}-1$)
ADIABATIC HORSEPOWER FACTORS
FOR
COMPRESSION OF NATURAL GAS
SP GR .6248 n = 1.315
BASED ON FORMULA
I.H.P. PER 100 CU. FT. PER MIN. PISTON DISP. = 1.823 $P_1(R^{.2395}-1)$
P_1 = ABSOLUTE INTAKE PRESSURE LBS/SQ. IN.
R = ABSOLUTE RATIO OF COMPRESSION
RATIO OF COMPRESSION = R

inches, and N = number of strokes per minute. The net area of the piston is the total area less one-half the area of the piston rod; the number of strokes, N, is twice the number of revolutions for a double acting cylinder. Now $\frac{LAN}{144}$ is the Piston Displacement of the cylinder in cubic feet per minute, therefore the equation may be written I.H.P. $= \frac{\text{M.e.p.} \times PD \times 144}{33000}$, and if P.D. is made equal to 100 cubic feet per minute then I.H.P. $= \frac{\text{M.e.p.}}{2.29}$, an exceedingly useful figure, since efficiencies of compression are all based on the horsepower per 100 cu. ft. per minute piston displacement. Indicated horsepower, however, is not a true expression of what actually occurs in the cylinder during compression. Various losses must be taken into account, and we must therefore modify our figures accordingly. Due to mechanical clearance, volume in the valve parts, etc. in a cylinder, it will never deliver its full piston displacement, and the ratio of actually delivered volume to the piston displacement is the volumetric efficiency of the cylinder, designated by V.E. It may be expressed as follows: V.E. = 1 — CL (R—1) in which CL = average *per cent* of clearance in the cylinder, and R = ratio of compression.

The horsepower is also affected by the compression efficiency of the cylinder (C.E.). This is the ratio of the theoretical power required to compress the amount of gas actually delivered to the actual power developed in the cylinder as shown by indicator diagrams. It may be expressed by the formula

C. E. = $1-Cl\ (R^{\frac{1}{n}}-1)$. For
n = 1.315, CE = $1-C1\ (R^{.761}-1)$ and for
n = 1.262, CE = $1-C1\ (R^{.792}-1)$. It is also a function of the gas speed through the valves, a low gas speed giving high compression efficiency and high gas speeds giving lower values. For good design of compressor cylinders, the gas speed should be kept if possible below 6000 feet per minute. When such is the case, the compression efficiency will average about 85%.

The final allowance to be made is that due to friction, or in other words, the mechanical efficiency (M.E.) of the cylinder. In well-designed units, the average M.E. is 95%.

Brake Horsepower Computation

We can now arrive at a definite value for the Brake Horsepower (B.H.P.) developed in a cylinder under any given condition. To do this, it is only necessary to take our formula for Indicated Horsepower (I.H.P.) and modify it to include the factors just described, as follows:

$$\text{I.H.P. per 100 cu. ft. per min. P.D.} = \frac{\text{M.E.P.}}{2.29} = \frac{4.175\ P_1\ (R^{.2395}-1)}{2.29} =$$

$1.823\ P_1\ (R^{.2395}-1)$ when n = 1.315

For n = 1.262, I.H.P. per 100 cu. ft. per min P.d. = $\frac{4.817\ P_1\ (R^{.2076} - 1)}{2.29} = 2.1035\ P_1\ (R^{.2076} - 1)$

Applying the corrections, and taking the amount of gas to be handled into account, we have:

$$BHP = \frac{P.D. \times VE \times P_1 \times 1.823\ (R^{.2395} - 1)}{M.E \times C.E. \times 100} \text{ for } n = 1.315$$

$$BHP = \frac{P.D. \times VE \times P_1 \times 2.1035\ (R^{.2897} - 1)}{M.E \times C.E. \times 100} \text{ for } n = 1.262$$

The value $1.823\ P_1\ (R^{.2395} - 1)$ or $2.1035\ P_1\ (R^{.2076} - 1)$ as the case may be, is called the adiabatic horsepower factor, per 100 cu. ft. P.D. The curve shown in Plate 1 gives values of $1.823\ (R^{.2395} - 1)$, therefore any value taken from the curve should be multiplied by the absolute intake pressure to determine the adiabatic factor. As stated in a previous paragraph, M.E. is usually considered to be .95 and C.E. will average .85, but to make a close check on the manufacturer's figures, it is always advisable to obtain the cylinder clearance and calculate the C.E., otherwise the horsepower will not check.

If clearance pockets are added to the cylinder, it will not be sufficient to average the clearances, but each end of the cylinder must be calculated separately. If compression is to take place in a number of stages, the compression for each stage will be the $\sqrt{R}$ for two-stage, $\sqrt[3]{R}$ for three-stage, etc. In such cases first find the total ratio of compression, extract the proper root corresponding to the number of stages of compression and proceed with the calculation of the low pressure cylinder. For balanced compression, with no loss in pressure between stages, the total BHP will then be twice the figure for the L.P. cylinder in two stage units, three times for three-stage, etc. However, it is sometimes necessary to run the machines at pressures varying from the theoretical balance, and even in balanced units, there is some pressure drop between stages, so that it is nearly always advisable to calculate each stage separately.

The concluding portion of Mr. Hanst's article, which will appear in January issue, will discuss such matters as the effect of peak load on compressor sizes, the selection of auxiliary equipment, the arrangement and construction of the compressor house, etc.

Pipe Threading Tests

FOR cutting threads on pipe the kind of cutting oil used is more important than is generally realized. It pays to make comparative tests using various kinds of cutting oil and then figuring and comparing costs after the tests have been run.

For example here are the results of some actual tests. I must not give the names of the cutting oils of course but I will say that No. 1 costs 29c per gallon from the manufacturer and 4c a gallon when mixed while No. 2 costs 82c per gallon from the manufacturer and 6¾c a gallon when mixed.

The figures below give the number of pipes threaded while using a full drum of each of these cutting oils, also the percentage of good pipe and the percentage of bad threads. It is interesting to note the number of die changes in the two oils. I was not told the cost of changing dies in this instance, but in making your own tests you can easily estimate your own costs.

Cutting Oil No. 1

	Pipe	Ends	Per Cent
Pipe threaded	102,676	205,352	—
Good pipe	90,881	181,762	87.30
Bad threads	11,795	23,590	12.97
Die changes, 816			
Cut per die	125	250	—
Good pipe per die	111	222	—

Cutting Oil No. 2

Pipe threaded	133,279	266,558	—
Good pipe	128,042	256,084	96.07
Bad threads	5,237	10,474	3.93
Die changes, 375			
Cut per die	355	710	—
Good pipe per die	341	682	—

These tests prove that the first cost of a cutting oil is not of much importance. The important thing is QUALITY. Use a *quality* oil and the ultimate cost will be lower. —*C. E. Schaphorst*

Notes on By-Product Ammonia

THE low prices of ammonia products have materially reduced the income from coal carbonization and some coke ovens must produce ammonium sulphate at a loss and know no other way of getting rid of the ammonia. However, in most locations, there is a demand for aqua ammonia and while prices are low, there is yet a profit in the operation with steam from modern boiler installations. It may not be advisable to recover all the ammonia in the form of an aqua, owing to lack of gas scrubbers, but minor changes can be effected in the liquor system, whereby more than the customary one-quarter of the ammonia will be absorbed in the condensate in the form of a weak liquor and from which one-half of the ammonia in the gas can be recovered as an aqua ammonia.

The process is simple and most of the equipment will be on hand, as the present ammonia stills will serve the purpose and while the quantity of ammonia to be distilled will be more than twice the ammonia distilled, when making a sulphate by the semi-direct method, the quantity of liquor will not be greatly increased, owing to its greater strength. The weak liquor is first passed through one still for preheating purposes, so as to drive out most of the impurities and some of the free ammonia into the gas stream to the saturator and the balance of the free ammonia and the fixed ammonia liberated in another still and the vapors cooled and the gas purified and absorbed in water for the production of aqua ammonia.

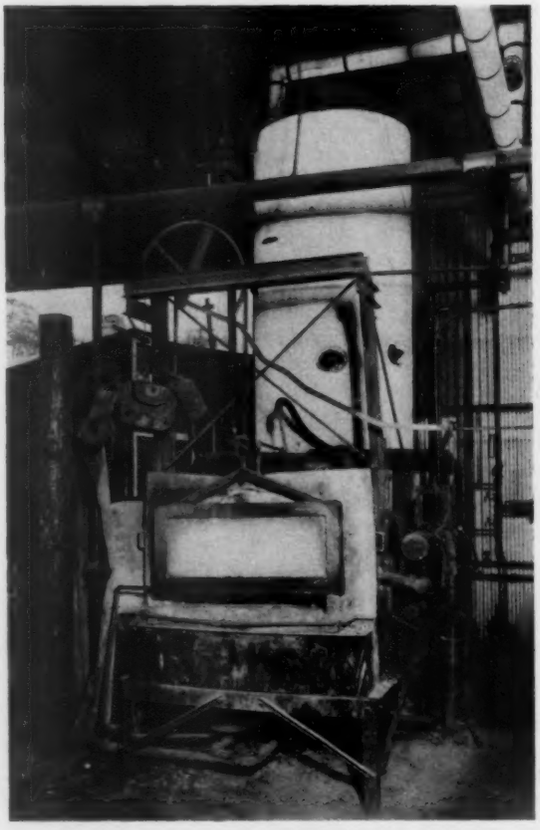
The production of sulphate will go on as before, but at a decreased rate and at times, when it becomes more convenient to make one product in preference to another, the proportion can be changed. There will be more steam used, when making an aqua, but this expense is small in comparison with the saving in acid and the decrease in drying and shipping expenses for the corresponding sulphate. —*John S. Unger.*

Putting Waste Heat To Work In The Forge Shop

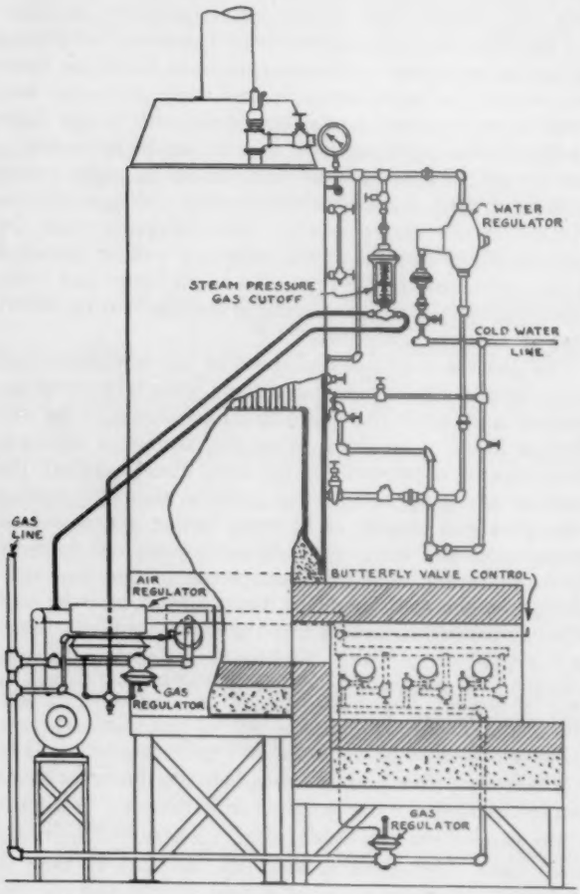
Utilization of Waste Heat From Gas Fired Forge To Assist in Firing Boiler For Supplying Steam Power To Hammer Makes Possible a Saving of Twenty-Two Percent in the Cost of Fuel

J. B. NEALEY
American Gas Association

HOT forging is one of the oldest of the sciences, and yet, until recently, it has been one of the most backward. Especially is this true of the metallurgical phase for, until lately, it was a fact that for every dollar spent in fuel, only about five cents was effectively utilized. The picture is slowly changing, however, due primarily to the development of forging furnaces that are more efficient both as to fuel economy and effectiveness in heating and the adoption of the refined fuel gas which helped make the other possible.



Front of Forge Showing Boiler in Rear



Side Elevation Showing Boiler, Forge and Control Equipment

Now comes a third development, from an entirely different angle, which actually reduces forge heating plus steam power costs by approximately 22%. Simple enough in design and realization it consists of using the waste heat from the forge furnace in the steam boiler which supplies power to the hammer. Thus two heating operations are accomplished with almost the same fuel consumption as one.

This proposition was worked out at the plant of the Skookum Company, Portland, Oregon, with the aid of the engineering department of the Portland Gas & Coke Company.

The Skookum Company makes a complete line of small tools for the logging industry, logging blocks, and miscellaneous heavy equipment. It also conducts a large jobbing business in machining and forging. Included in the plant equipment are two steam hammers and a trip hammer which are served with two gas fired forge furnaces. These furnaces are built in combination with tubular vertical steam boilers, both resting on a steel framework so designed that the firebox of the boiler nests into the upper back wall of the furnace, the waste heat flowing through an opening in the back wall directly into the firebox. One of these boilers is 20 and the other 30 horsepower.

The furnace sets about two feet above the floor and

the boiler three feet and both are nicely fitted, bolted and cemented together. The furnace is heated with three gas burners on each side, or six in all, and they fire tangentially against the arch and are staggered so as not to fire into each other. The furnace is of brick construction (9 in. of firebrick), heavily insulated and has a 3 x 4 foot hearth. The burners are of the nozzle mixing type, air being supplied by blower at 4 inch pressure which is equal to the gas pressure at that point. The boiler is provided with an auxiliary gas burner to which air is supplied from the same manifold. The gas-air mixture for the furnace burners is reducing, to minimize scaling, and in order to complete combustion in the boiler firebox and not smother the boiler burner flame, an excess of air is provided through the auxiliary burner. The waste products of combustion finally leave through a stack in the top of the boiler.

Automatic Operation Via Steam Pressure Control

This combination forge furnace and steam boiler is equipped to operate automatically through a steam pressure control which in turn regulates the volume of fuel to the auxiliary burner and three of the furnace burners. This is a two stage operation, the first stage consisting of a steam control valve in a bypass air line, the valve being held open by a spring against the steam pressure. When the steam pressure rises above a point set on the control index, it forces the valve shut, thus cutting off the air supply.

The bypass line runs between the main air supply line and diaphragm operated valves in the air and gas lines to the burners. This constitutes the second stage, for the air pressure from the bypass to one side of the diaphragms, keeps the valves open and the burners firing. As soon as the steam pressure r ses too far, the steam valve closes and shuts off the air pressure, which in turn allows the diaphragms and their valves to sink and close off the flow of air and gas to the burners. Conversely, when the steam pressure drops, the steam valve opens and restores the air pressure which in turn forces open the diaphragm valves.

Consequently the auxiliary burner and three of the furnace burners are under automatic control, going on and off with the rise and fall of the steam pressure, which is a measure of the work being put through the hammers. During this time the other three burners in the furnace burn continuously, the air supply coming from a different blower. The auxiliary burner only requires a pilot light.

The greatest problem incident to this development was to obtain the closest heat balance possible between the furnace and the boiler and at the same time utilize all of the waste heat from the furnace. The results are most gratifying. When one of these units is started up in the morning, all seven of the burners are firing until the steam pressure in the boiler is up to the required point, when the regulators automatically shut off four of them. When a considerable volume of work is being put under the hammers the steam consumption is immediately increased and all seven burners fire to capacity. While the furnace will heat steel to the forging temperature with three burners, it will heat it enough faster, with all six going, to supply the greater demand of the hammer crew. In other words, capacities of the furnace and boiler not only balance very nicely but quickly respond to any demand that the hammer crew may require of them. This is directly due to the flexibility of the volume of fuel supply and its quick response to the automatic controls.

The steam boiler is rendered entirely automatic with the addition of a water regulator and a steam water pump. The regulator is cut into a steam line from the boiler to the pump, and when the water level drops below a certain point, a float valve in the steam lines opens so that the steam can pass to the pump. When the pump has forced enough water into the boiler the float valve rises to its former position and cuts off the steam supply.

A test run of two days' duration was made on the forge served with the 30 h.p. fire tube boiler with the forge operating at about half of its capacity. Half of the test was with large pieces of steel which practically filled the forge while the other half was on small pieces only partly filling the heating chamber. The results were as follows:

Computed Data

Total gas input	74,500 cu. ft.
Forge gas input	49,120 cu. ft.
Total steel heated	5,080 lbs.
Estimated temperature rise of steel	2200°—80°=2120° F.
Specific Heat of Steel	.117
Boiler steam pressure	110 lbs. gauge
Assumed quality of steam	95% dry
Assumed feed water temperature	50 deg. F.
Total water evaporated by boiler	15,942 lbs.

1. Eff. of Forge in Heating Steel (Forge gas only)

$$\text{is } \frac{5{,}080 \times .117 \times 2120^\circ}{49{,}120 \times 570 \text{ B. T. U.}} = \frac{1{,}262{,}000 \text{ B. T. U.}}{28{,}000{,}000 \text{ B. T. U.}} = 4.5\%$$

2. Percentage of Total Heat Supplied Utilized in Heating Steel (Forge gas + boiler gas)

$$\text{is } \frac{5{,}080 \times .117 \times 2120^\circ}{74{,}500 \times 570 \text{ B. T. U.}} = \frac{1{,}262{,}000 \text{ B. T. U.}}{42{,}500{,}000 \text{ B. T. U.}} = 3.0\%$$

3. Overall Efficiency (Heating Steel + steam generation)

$$\text{is } \frac{(5{,}080 \times .117 \times 2120^\circ) + 15{,}942\ (.95 \times 874.7) + (315.5 - 18.1)}{74{,}500 \times 570 \text{ B. T. U.}}$$

$$= \frac{1{,}262{,}000 + 17{,}960{,}000}{42{,}500{,}000} = \frac{19{,}222{,}000 \text{ B. T. U.}}{42{,}500{,}000 \text{ B. T. U.}} = 45.0\%$$

4. Average Horse Power Developed by Boiler:

$$\frac{15{,}942 \text{ lbs. water}}{19.5 \text{ hours}} = 817 \text{ lb. water per hour evaporated to steam at 110 lb. gauge pressure.}$$

$$\frac{817 \text{ lbs.} \times 1127.4 \text{ B. T. U.}}{34.5 \text{ lbs.} \times 970.4 \text{ B. T. U.}} = 27.5 \text{ horsepower}$$

5. Cost of heating steel to forging temperature:

Cost of Forge Gas Per Lb. of Steel at $.33 per M. ft.

$$\frac{49.12 \times \$.33}{5{,}080} = \$.0032 \text{ per lb. steel}$$

Cost of total gas per lb. of steel

$$\frac{74.5 \times \$.33}{5{,}080} = \$.00485 \text{ per lb. steel}$$

Heat value of gas is 570 B.t.u. per cu. ft.

Analyzing the above figures we find that, according to the meter, the input of gas to the forge was 49,120 cu. ft. If the boiler had been operated as a separate and independent unit, and assuming an efficiency of 70%, it would have required 46,500 cu. ft. of gas to raise the equivalent amount of steam. Adding these two figures we find that 95,620 cu. ft. of gas would have been necessary to operate the forge furnace and steam boiler as separate units. Actually, however, with the waste gases being utilized, the combination forge and boiler, according to the meter, used only 74,500 cu. ft. of gas. The difference of 21,120 cu. ft. represents a saving of about 22%. Furthermore this was accomplished with the forge operating at only about half its maximum capacity which indicates that still greater savings are possible.

Steam Accumulator Might Save Fuel

There is another possibility of saving fuel in a forge shop and that is by the use of a steam accumulator. The use of this device is indicated in operations where the

power load is intermittent. The accumulator is a special tank which stores steam during off load periods for use at times of peak load. During low load periods, an automatic control system directs into the accumulator, all steam generated by the boilers but not immediately wanted at the hammers. The accumulator contains water at saturation temperature. The entering steam is condensed and gives up to the water its latent heat. Both the temperature and pressure within the tank gradually rise during such periods of charging.

Whenever the hammer demand exceeds the supply from the boilers, the same control system causes a drop in pressure within the tank. A process of ebullition takes place and the entire heat introduced with the charging steam is recovered in the steam discharged. Water is flashed into steam at very high rates corresponding to the pressure drop and extent of evaporative surface. In practice the rate at which steam can be withdrawn from the accumulator is limited only by the size of outlet connection. Ample steam will, therefore, always be available to cover peaks and the steam flow from the boilers will not be affected. With such an auxiliary it is possible to use smaller boilers, or a lesser number of boilers, to perform the same amount of work. It is conceivable that a saving of as much as 25% could be made in power equipment in this manner.

Gas Waste in Canada

ONE of the most urgent problems now facing the government of Alberta is that presented by the waste of gas in Turney Valley. The problem is made difficult by the conflicting interests; gas consumers are alarmed by the danger of complete loss of gas supply, and on the other hand many people have invested in the oil companies operating locally and are equally dismayed by the thought of cutting down the flow of gas for fear their investments may suffer. The administrative problem has been pressing ever since October 1, 1930, when the provincial government took over natural resources from the Dominion.

Until recent months it was not certain that Turney Valley would become an important oil field, and before much development had been completed a contract to supply gas to Calgary had been negotiated. On the basis of the contract, the company built a scrubbing plant essential to eliminate the sulphur content from the gas. The same company later obtained control of a large percentage of the acreage in the Valley. The naphtha content has fallen rapidly in many wells, and technical experts state that a continuance of the present waste may exhaust the gas in the Valley in a very few years.

Three courses of action are possible: (1) To consider the field as an oil field and ignore gas waste. The fact that the naphtha content is decreasing seems to make this course undesirable. (2) To work out a voluntary agreement among all interested parties. (3) To take legislative action which might result in the inability of many of the smaller independents to carry on, and therefore react to the advantage of larger companies.

The Government first held conferences with all parties interested in the Valley, and it was decided to act in cooperation with an advisory committee representing all non-government interests. This committee, or board, which is fairly representative of both large and small producers, brought to its assistance an American gas expert. As a result of deliberations, it has been decided to restrict the gas flow to approximately 100,000,000 feet a day, to pool available gas for distribution to Calgary and to increase payment for the gas by approximately $0.04.

The general principle behind the plan is to conserve the gas and naphtha, spreading distribution over a longer period of years, and by increased price providing a greater ultimate return than is considered possible if the present waste is continued. The plan can succeed only by assistance from the interested companies and perhaps by the gas consumers of southern Alberta, and the Government is now negotiating to see if this assistance will be forthcoming.

The government concedes that any scheme which would benefit producers must benefit the company controlling about 50 per cent of the output. It is equally certain that if no action is taken many independent companies will be forced out of existence from financial inability to carry on. The government's effort is to protect so far as possible the investors in the Valley, and at the same time safeguard the resources.

The majority of independent operators in Turney Valley favor organization of a gas sales association, whereby a pipe line would be installed and waste gas sold to Winnipeg, Regina, Vancouver or cities over the border in the United States, in preference to the gas pooling agreement proposed by government experts, by which more than 400,000,000 cubic feet of gas daily would be shut in the wells. The sentiment is that a better solution would be for the government to allow the companies to market all the gas produced, by carrying a pipeline to some large center of population. —*Consul Samuel C. Reat, Calgary.*

Coking of Washington Coals

THE results of an investigation of the feasibility of the manufacture of coke for the iron blast furnace from the coals of an extensive, undeveloped area of Pierce County, Washington, conducted by the United States Bureau of Mines, Department of Commerce, in cooperation with the University of Washington, are given in two reports recently made public by the Bureau Agglutinating, coking, and by-product tests of the coals are described in Bulletin 336, by S. M. Marshall and B. M. Bird.

The agglutinating tests of the coals, and a shatter test and physical examination of the coke from a commercial by-product oven test, indicate that the cokes from these coals are equal to or better than the average eastern and southern blast-furnace cokes in toughness and strength, state the authors in summarizing the tests described in Bulletin 336.

The porosity tests and the combustibility tests of the oven coke, also the results of blast-furnace operation, indicate that the coke will drive satisfactorily in the iron blast furnace, but that it could probably be improved in this respect by mixing with the coals from this area some coals of higher volatile content.

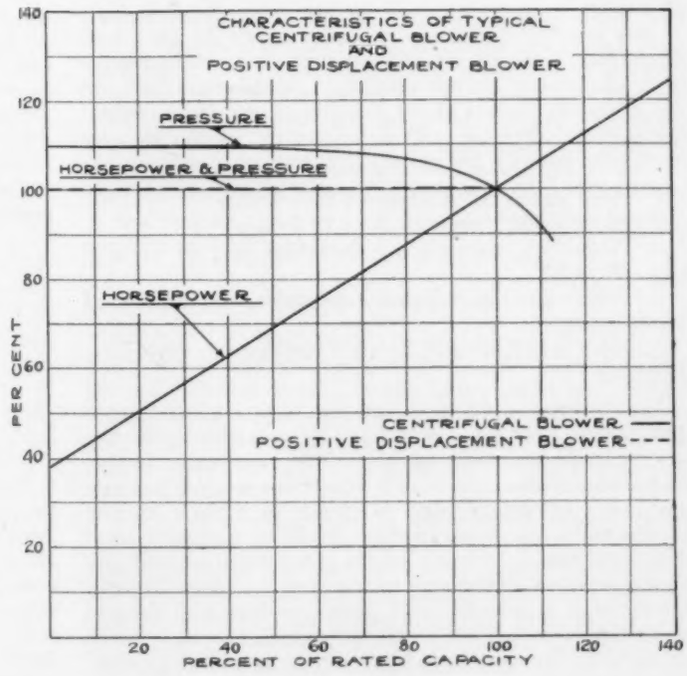
The laboratory by-product results, which have been correlated with commercial practice, indicate that the average coal of this area washed to an 11 per cent ash basis has the following commercial yields, dry basis: Coke, 80.36 per cent; sulphate, 34.49 pounds; tar, 7.58 gallons; light oil, 2.40 gallons; and gas, 10,988 cubic feet.

Industrial Furnaces For Gas

XI-Accessory Equipment

L. E. BIEMILLER

Supervisor Fuel Sales, Consolidated Gas Electric Light and Power Company.



THIS series of articles has discussed different types of furnaces and in doing so has referred to burner systems and to certain accessories without explaining them. However, at some point in such a series it is desirable to classify, define, and explain such equipment.

Burners

A burner may be considered as a device which has one or more restrictions to prevent the flame from flashing back, and a locality adjacent thereto where the flame can burn. It is convenient to classify burners upon the means used to hold the flame to the burner after it emerges from these restrictions. So classified, burners may be considered as simple, complex, and impact. Simple burners include drilled port bar burners, ribbon burners, ring burners, and slight modifications of these with cluster or other special heads. These burners have one common quality, that is, no special means for holding the flame on the burner after its emersion from the restrictions. Complex burners include nozzle burners, and nozzle mixing burners. They are characterized by an expanded cross-section immediately following the restriction from which the combustion gases emerge. The impact burner, so called, does not attempt to hold the flame on the burner at all, but allows the combustion to take place on some refractory material, some inches from the restriction through which the air-gas mixture comes.

A combustion system can best be considered as the system by which the gas and the air required for its combustion, are mixed. All of the above burners can be used with more than one combustion system, and a clear understanding of a type of burner can be had only in relation to the combustion systems with which it is used. Combustion systems can be classified as follows:

1. Injecting Medium—Gas
   a. Atmospheric pressure—less than 6 in. water
   b. Medium pressure—1 to 4 pounds
   c. High pressure—4 to 25 pounds
2. Injecting Medium—Air
   a. Two valve system—gas usually at low pressure —air at any pressure.
   b. Single valve with low pressure air—one pound
   c. Single valve with high pressure air—30 pounds up.
3. No Injecting Medium
   a. Yellow flame burners
   b. Mechanically proportioning duplex valves—gas and air at any pressures.
   c. Mechanically mixed and compressed air-gas mixtures.

Drilled port bar burners are used most frequently with gas at atmospheric pressure, injecting part of the air required for combustion through mixer boxes or venturi injectors. When so used the average size of port is about 5/64 to 3/32 inch diameter. Not much advantage is obtained by increasing the gas pressure when the same size of ports are used. The quantity of injected air is increased, and the flame is shortened, but this is limited by the low burner pressure necessary. When some ribbon burners, or burners with special cluster heads, with small drillings are used, the gas can be utilized up to pressures of 5 or 6 pounds, with practically all the air injected as primary air. This gives a short flame which can often be utilized with high efficiency. The same holds for an air-gas mixture obtained by using any of the combustion systems listed under class 2, or sections b and c of class 3. It is important to realize that any burner functions as a result of the air-gas mixture which reaches it, and the pressure thereof; so a given burner will function the same way if this mixture and pressure are the result of any of the several combustion systems capable of furnishing them.

Nozzle Burner Characteristics

The nozzle burner is extensively used on industrial furnaces developing temperatures in excess of approximately 800° F. It normally backfires at about one-half inch burner pressure, so it cannot well be used with the atmospheric gas system. It is normally used with gas

at 4 to 25 pounds, injecting the air, or with air at high or low pressure injecting the gas. It can be used with mechanically mixed air and gas mixtures, which results in a satisfactory burner pressure. With manufactured gas requiring 5 parts of air per part of gas, for a neutral flame, the following maximum burner pressures may be developed with the several combustion systems:

1. With gas at 10 pounds—4 to 5 inches
2. With air at 1 pound—8 to 14 inches
3. With high pressure air, injecting part of air and gas—6" to 8".
4. With two pipe system—depending on design of injector tee.
5. With mechanically mixed—depending on many variables.

Nozzle mixing burners, as the name indicates, are designed so that the air and gas do not mix until they reach the nozzle of the burner. This results in a longer flame than is obtained from a nozzle burner. It has one particular advantage, that is it can be turned as low as desired without backfiring. It is of necessity used with combustion systems which carry both air and gas under pressure all the way to the burner nozzle. Usually the air is at a pressure of 1 pound or less, and the gas at atmospheric pressure. Proportional mixing can be obtained by the use of mechanically proportioning valves of several types.

Impact burners can be used with any of the combustion systems that nozzle burners are used with. The only difference between these types of burners, is that the expansion after the restriction of the impact burner is not sufficient to hold the flame on the burner.

Yellow flame burners are used mostly as pilots. They are supplied only with gas, with no provision for injecting any air. As a result, the gas emerging from the burner port burns with a relatively long yellow flame, reaching out for the necessary air for combustion. Such flames are used where it is desired to burn a small quantity of gas with minimum possibility of backfire, or flame blowing from the burner.

Combustion Systems

The combustion system using gas at atmospheric pressure is characterized by the fact that only part of the air, usually about 40 per cent, is injected as primary air. Therefore, the atmospheric burner must be applied so that the necessary secondary air is permitted to reach the burner. The flame is relatively large, and is not suitable for developing high temperatures because of the large combustion space needed. Since such a large percentage of the air required is used as secondary air, it is difficult to approach theoretical air gas proportions and obtain maximum thermal efficiency. For these reasons the atmospheric gas combustion system is not used in connection with the industrial gas furnaces so far discussed.

When gas at 1 to 4 pounds is used it will inject all the air required if the burner is equipped with a satisfactory mixer box, or preferably a venturi injecting tube. However, when a burner operating on this system is turned down to 50 per cent capacity, the proportion of air injected will decrease. This system is not well adapted for use with nozzle burners, as they will backfire with relatively little turn down. If used with bar burners, the ports must be smaller than is the case with the same type burners for atmospheric gas, to prevent the flame being blown off at full pressures.

When gas at 4 to 25 pounds pressure is used with properly designed injectors, it will inject all the air required for combustion and furnish the air gas mixture to the burners at a high pressure. With manufactured gas at 10 pounds, approximately 5 parts of air per part of gas will be injected, and with natural gas at 20 pounds, approximately 10 parts of air will be injected, with the proper relationship of orifice venturi, and burner size. Then the valve supplying such a burner can be partially closed and the same air gas ratio will be maintained. The following is an example for 530 B.t.u. gas, burnt with a nozzle burner:

Gas Pressure	Burner Pressure	% Maximum Capacity of Burner	%Air* Injection
10 pds.—line pressure.....	5.0	100	100
8 pds.—valve partly closed..	4.0	90	99.9
6 pds.—valve partly closed..	3.0	77	99.7
4 pds.—valve partly closed..	2.0	63	99.2
2 pds.—valve partly closed..	1.0	45	98.9
1 pd. —valve partly closed..	.5	31	98.8
Less than 1 pd.		Back Fires	

* % of theoretical air required for perfect combustion.

This table illustrates the necessity for selecting the proper size of burner for an industrial furnace. If a burner is selected which will burn 100 cu. ft. of 530 B.t.u. gas at 10 pounds and inject the air for perfect combustion, when only 63 cubic feet were required, the burner will be operated at only 4 pounds. This burner will backfire when reduced to 31 cubic feet of gas, or 50% of maximum capacity at which used. On the other hand if 125 cubic feet of gas were required, the burner could not pass it and inject the air for perfect combustion. If the orifice were made larger to pass more gas, less air would be injected and the furnace atmosphere become reducing. If a burner designed to burn 100 cubic feet of gas had its orifice reduced to pass only 63 feet at 10 pounds, the atmosphere would become heavily oxidizing.

With the two valve system, air and gas are mixed through a mixing tee where the air enters one end of the tee and is released through a nozzle which extends just past the center line of the side outlet where the gas enters the tee. This results in a mixture which leaves the tee just opposite the air nozzle. The difficulty with the two valve system is that the same air gas proportions and the same furnace atmosphere cannot well be maintained when the quantity of fuel supplied the furnace is varied.

Use of Single Valve System

The single valve system utilizing air at 1 pound is extensively used on industrial gas furnaces. Air at 1 pound is supplied through a nozzle to a venturi injector at the entrance end of which there is a source of gas. This gas is supplied through a "zero governor" which maintains a zero pressure on the outlet side of the governor which is at the entrance of the venturi. Then the air entering the venturi creates a vacuum at this point and injects gas in a constant proportion to the air passing. The desired proportions can be set by adjusting a valve on the outlet side of the governor. This proportional mixing is maintained, provided the vacuum created at the entrance of the venturi by the air is over .5 inch of water. This vacuum will be more than .5 inch if the air pressure is over 4 ounces and the air gas mixture is utilized at a pressure of over .5 inch. As a result, this system operates very well with nozzle burners, though a satisfactory burner turn down cannot be obtained unless the air pressure is well over this minimum of 4 ounces. In order to get maximum burner pressures and maximum turn-down, it is essential that the air nozzle before the venturi be of the correct size.

The single valve system utilizing high pressure air works upon the same principles. Gas is supplied

through a zero governor. Air is supplied through a nozzle to a venturi. Since the air is at high pressure, it develops a very high velocity pressure and injects through a sleeve valve other air from the atmosphere, as well as the gas from the zero governor. The percentage of the total air which is used as high pressure air depends upon its pressure. Normally, it is from 10 to 20 per cent. This system will often be found very convenient where high pressure air is available at the point in a plant where the gas furnace is to be located.

Mechanical Valves

Air and gas can be mixed by mechanically proportioning valves which are designed to pass a given ratio of air and gas when the valves are open varying amounts. Such a proportional mixer usually consists of two valves, one for air and one for gas, interconnected by levers so as to work in unison. The desired air-gas ratio can usually be set by adjusting the length of the lever arms, or by adjusting sleeves which are an integral part of the valves. Air and gas can also be mixed and compressed by compressor units which both mix and compress the air and gas at one central location, from which it is piped to the individual burners and furnaces normally at a pressure of about one pound. This facilitates maintenance of an exact furnace atmosphere, and permits the use of very small combustion chambers.

Gas and Air Compressors

In the two valve combustion system, air is frequently used at pressures from 1 to 10 ounces. This is usually supplied by a centrifugal fan consisting of an impeller wheel upon which is mounted a series of blades, all revolving in a fixed casing. The fan is directly connected to an electric motor and operates normally at about 3600 r.p.m. There is sufficient clearance between the blades and the casing so that no relief valves or bypasses are necessary when the discharge is closed completely. Since the delivery pressure for a given speed varies as the density of the fluid, materially lower pressures are obtained when such fans are used as gas boosters. Usually only sufficient pressures can be obtained to compensate for pressure losses in gas distribution systems which are too small, and these gas boosters cannot be used to secure pressures high enough to result in satisfactory air injection in connection with injecting type burners. These fans must not be confused with ventilating fans, which have large capacities but which work against only very small pressures.

The same general type of blower can be built with several sets of blades or impellers placed in series, so that the air from the outlet of one stage is fed to the inlet of the next stage. These multi-stage centrifugal blowers can be used to obtain pressures in excess of 5 pounds, but they are used chiefly for 1 to 2 pound air. They operate at from 1800 to 3600 r.p.m., and have the same characteristics as the previous centrifugal fans. They are not extensively used as gas compressors, since they develop normally only 40 to 60 per cent of the pressure that they develop when used with air.

Figure eight type, positive displacement compressors, are used to compress both air and gas to pressures of 1 to 5 pounds. They consist of two impellers, rotating in opposite directions on parallel shafts, in one casing. The clearances between impellers and case are measured in thousandths of an inch. The slippage due to this clearance ranges from 10 to 30 per cent, depending on the size of the unit. They may be directly connected or gear and pinion connected to electric motors, or belt connected to motors or line shafts. They normally operate at from 150 to 1000 r.p.m., depending upon their size. Since the slippage is small, these units have to be equipped with either a relief valve in the case of air, or a by-pass. The power required is dependent upon the speed of the machine and the pressure, and is constant with variations in load. It is important that the by-pass, in the case of gas pumps, be large enough to by-pass the maximum desired quantity of gas. The smaller the by-pass the greater the tendency to overheating, which may be dangerous.

Rotary Compressors

Within the same range in pressures, the eccentric rotor type compressor with sliding vanes is used. It has the same characteristics as the figure eight type. When operating at pressures under 4 pounds it is air cooled, but it may also be used at pressures from 4 to 20 pounds if it is water cooled. It can be used equally well as a gas compressor.

There is another type of rotary compressor which can be used from 4 to 20 pounds. It consists of a rotor with a series of chambers or spaces around a cylindrical hub revolving in an elliptical casing filled with a liquid, usually water. This shape of casing permits the centrifugal force to project the water out of the rotor, drawing in air or gas through the inlet ports. Further rotation forces the water back into the rotor chambers, compressing the air or gas, which is then discharged through the outlet ports by reentering water. They operate at from 250 to 1600 r.p.m., depending upon size, and may be direct or belt connected to the source of power. They are equipped with relief valves or bypasses, and the power remains constant for a given speed and pressure, independent of variations in output. In the case of gas compressors, the disposition of the gas saturated water, some of which is continually flowing through the machine, is a very serious problem. There may be an appreciable loss in the B.t.u. of the gas due to its components removed by such water.

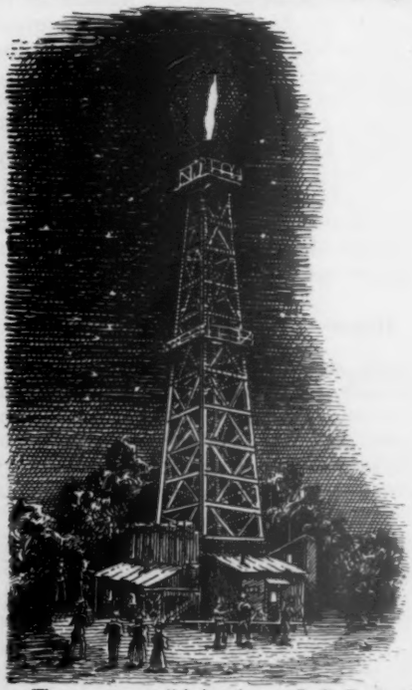
Large Volume Compressors

For compression in large quantities, at pressures of over 5 pounds, reciprocating compressors are extensively used for both air and gas. This type of compressor can be operated with a throttling regulator on its inlet so as to result in large power savings at partial loads. Since these operate at speeds less than 500 r.p.m. normally, there is a certain pulsation, and receivers are necessary. With the proper size receiver and a sensitive pressure regulator, practically non-pulsating output can be obtained.

Machines which both mix and compress the air and gas are modifications of some of the preceding, with special valve mechanisms. Particularly multistage centritugal, and figure eight compressors are used. It is important that the correct size and type of gas or air compressor be used in connection with industrial gas furnaces, as this is an appreciable item of cost of furnace operation.

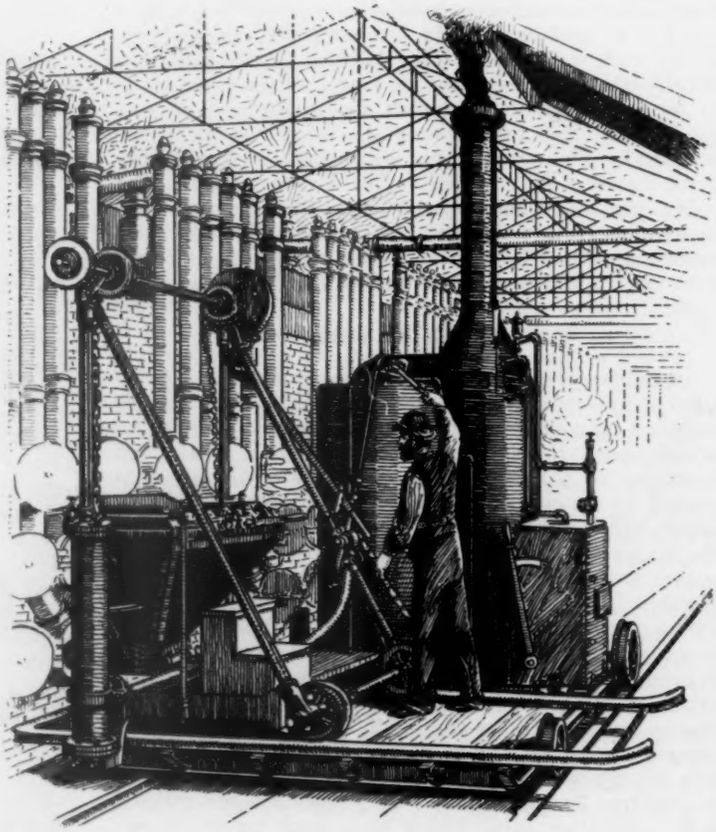
Can You REMEMBER When?

by ~ Frank D. Curley



The new gas well belonging to J. G. Beale (Leechburg, Pa.) has just been finished, having a three-inch pipe leading to the top of the derrick, and when the gas is lit it illuminates the country for miles around. American Gas Journal, Oct. 2, 1880.

We are informed that arrangements have been made with Mr. Ross to put his charging and drawing machines into the Eighteenth Street station of the Manhatten Gas Works in this city (New York), just as soon as the machines can be completed and set up. American Gas Light Journal, Aug. 2, 1880.



Mr. Egner, Engineer and Superintendent of the Laclede Gas Light Company, St. Louis, has had the usual experience of later days in the matter of workmen who wish to exchange places with their employers; but Egner knowing the remedy, did not scruple in applying it. On May 15th his retort house men, to the number of 50, approached him at 10 A.M. and demanded their "rights"—"Ten hours' pay for eight hours, work." The astonished engineer was accorded ten minutes for consideration and decision. Mr. Egner returned a flat refusal and out they walked. Before they had passed through the gate he shouted he would give them two hours to reconsider. None returned within the time set apart, and inside of eight hours new gangs were in front of the benches. The substitution was so well effected that ordinary rate of pressure was carried on the mains during the whole time. On the 19th the men offered to come back on the old basis, but Mr. Egner declined to receive them. American Gas Light Journal, June 2, 1886.

Sound Proof Insulation For Natural Gas Piping

C. A. PHILPOTT

Office Engineer of Construction, Pacific Gas and Electric Company

THE flow of natural gas through piping sometimes creates considerable noise, which depends chiefly upon the kind of valves, regulators, meters, etc., through which the gas has to pass. A vibrating body is essential to the production of sound and an elastic medium, either solid, liquid or gas in contact with this body is required to transmit the vibrations. Thus a vibrating mass of air or gas in a solid enclosure, a regulator valve, orifice meter disc, etc., may produce sound. In a regulator and meter station most of the sound is probably produced by the regulators, valves and meter discs.

Large quantities of gas may be passed through certain kinds of piping, producing but very little sound, and in other installations considerable noise may be created. Gas flowing at the rate of 215 million cubic feet per day, through the cooling coils and headers at the Kettleman Hills Compressor Station, produces practically no noise, yet only a few million cubic feet per day through some meter or regulator installation may create a very loud sound and in order to eliminate this, some kind of absorbing material is necessary. At Milpitas Meter Station 3,250,000 cubic feet of gas per hour flowing through the pipes with valves wide open, regulators by-passed and flowing through five bends caused no noise, but just as soon as one of the valves was throttled, vibration set in and considerable sound was produced.

Sound waves travel through solid, liquid or gaseous substances at a velocity depending upon the elasticity and density of the substance, according to the formula:

$V = E/d$ where V, E and d represent velocity, elasticity and density. In air the velocity is 1088, water 4827, pine wood 10,900, brick 11,980, and steel 16,360 feet per second.

The velocity of sound will vary directly as the square root of the absolute temperature, but it is not influenced by pressure.

Intensity and Loudness of Sound

The intensity of a sound refers to a quantity which determines the rate of supply of vibrational energy. Loudness corresponds to the degree of sensation and is dependent on the intensity of the sound and the sensitiveness of the ear. Frequency is the number of regular or periodic vibrations per second. Sounds arrange themselves in a natural order, according to pitch, which depends on the frequency of the vibration. The greater the frequency the higher the pitch.

The absorption of sound is the essential factor in the solution of sound insulation and it is not sufficient to reflect and scatter the sound waves for the energy cannot be destroyed in this manner. It must be absorbed, that is converted into heat by friction.

When the air space in which sound is passing becomes small in cross section, friction occurs between the sides of the passage and the oscillating air particles which converts the wave energy into heat.

Buildings are acoustically treated by lining the walls and ceiling with some kind of absorbing material and the passage of sound from one room to another may be prevented by filling the partition with a satisfactory substance. There are many kinds of material on the market that may be used but, with the exception of Banrock and a very few others that have a suitable coefficient of absorption, they are subject to damage by fire.

Considerable work has been done in the acoustical treatment of buildings by Professor W. C. Sabine, Professor F. R. Watson, V. O. Knudsen and others but, so far as I know, very little in the way of sound-proofing pipe lines. However, as stated above, the sound must be absorbed, not reflected, and the results of their experiments with different materials should apply to pipe out in the open as well as when used for sound absorption in a room.

In order to have some basis of calculation, a unit of absorption has been chosen as one square foot of surface, which absorbs all the sound and reflects none. An open window absorbs all the sound from without and thus is assumed to have a coefficient of absorption of one.

Variation of Absorption Coefficient

The absorption coefficient varies with the frequency or pitch of the sound and in the selection of a material the frequency should be known as they vary for different piping installations. A material might be satisfactory for one frequency but not so suitable for another. The absorption coefficients of a material become greater with the increase of frequency until the frequency reaches a certain point and then as a rule they begin to decrease. In the majority of tests made, this decrease in absorption occurs somewhere between 2040 and 4096 vibrations per second.

The absorption and transmission of sound vary with the thickness of the absorbing material, but not in direct proportion. For example, tests made in acoustical treatment of buildings have shown that the intensity of the sound decreases according to the exponential law $S_t = S_o A^{-x}$ where S_o and S_t are respectively the sound that enters and is transmitted by the material, A is a constant and x the thickness of the material. Nashkote A at a frequency of 512, which is one octave above middle C, has the following absorption coefficients: ½" thick—0.25, ¾" thick—0.27, and 1" thick—0.33.

Perforating some absorbing materials with small holes approximately three-fourths of the way through the ma-

Read before Organization Conference, Pacific Coast Gas Assn., Nov. 20, 1931.

terial permits the entrance of more sound waves into the material and increases its absorption value. In the case above, the perforations give the following results: ½" thick—0.43, ¾" thick—0.51, and 1" thick—0.58.

Materials are also made with a metal or hard perforated face and a soft absorbing substance in back of it. The sound waves enter the perforations and are absorbed by the material. The Burgess muffler used in automobiles is an example of this principle.

The selection of a material for pipe insulation should depend upon its absorbing qualities, the frequency of the sound and where it is to be installed. In a dry room either hair felt, Banrock, or some similar material could be used, but the hair felt and many other materials would not be satisfactory in a damp place or where they are exposed to the weather. Banrock, however, being made of stone, is not affected by dampness, is fireproof and not subject to deterioration because it has no free lime content. Some rock wools have a lime content.

The following table gives the absorption coefficients for a few materials at various frequencies:

		Frequency				
Material	**Thickness**	256	512	1024	2048	4096
Banrock	1¼"	...	0.57	...	...	...
Brick	....	...	0.025	...	...	...
Concrete	....	...	0.015	...	...	...
Glass	Single	...	0.027	...	...	...
Hair Felt	1"	...	0.58	...	...	...
Wood Sheathing	....	...	0.061	...	...	...
Cork Tile	1⅛"	0.13	0.33	0.42	0.42	0.15
Lime Plaster on Wood Lath	....	0.024	0.034	0.030	0.028	0.043
Nashkote AX	1"	0.34	0.69	0.80	0.59	0.49
Ozite	¼"	0.10	0.13	0.25	0.37	0.47
Perforated Metal over 2" Hair Felt	....	0.53	0.81	0.63	0.58	0.52
Rock Wool Blanket	1"	0.40	0.56	0.65	0.68	...

In order to eliminate the noise produced at the Milpitas Meter Station, it was decided to install granulated Banrock around the pipe, meters, etc. Tests showed the vibrations to be approximately 656 per second.

The installation consists of a tongue and groove box built in 5-foot sections around the pipe. Each side is built as a separate unit and they are bolted together in such a manner that any one of them may be easily removed. Segments made of wood are placed around all flanges and at the end of each section or approximately every five feet along the pipe to support the housing. A clearance of about six inches is allowed around the pipe and the space is filled with Banrock tamped in to about 15 pounds per cubic foot of space. Drain holes spaced 2'6" are bored in the bottom to allow any moisture to seep out and vent holes are placed along the sides near the top to allow for circulation of air. These holes are bored at a slant screened on the inside and protected from the rain on the outside with flashing.

Before the installation of this Banrock, with the regulators in or the valves throttled, the noise was so great that it was almost impossible to use the telephone in the office nearby, but now there is practically no noise. This could have been further eliminated if it had been possible to completely insulate the gears on the plug valves.

I believe just as good, if not better results could be obtained by installing a housing around the pipe as described above and lining the housing with an absorbing material leaving an air space between the pipe and the insulation. While the Banrock, being in contact with the pipe absorbs most of the sound, the fibres may act as a better conductor than the air space. Also insulation between the wood segments supporting the housing and the pipe would help to further eliminate the sound.

National Assets

LET us look at the background against which American business today is projecting its efforts to succeed at home and abroad. Let us review our national assets. Here are a few of our social assets:

1—A stubborn and transcendent belief in ourselves and in our future.

2—A confidence in the tradition, born of 150 years of history, that America can meet and conquer any crisis.

3—A determination to give our children a better place to live in and more of comfort and enjoyment.

4—A tremendous fund of American ingenuity, adaptability, alertness and courage, with which to meet any and all problems.

5—A people sane and sober in the midst of economic alarms, with a standard of intelligence, the highest in the world, which can not be stampeded to embrace political or economic nostrums.

Here is a list of our economic assets:

1—A national wealth of $350,000,000,000.

2—A population of 120,000,000 people with 40,000,000 of them gainfully employed, despite our unemployment problem, making up the greatest consuming market the world has ever known.

3—A manufacturing industry doing an annual business of $70,000,000,000.

4—A wholesale establishment handling merchandise transactions to the amount of nearly $70,000,000,000 a year.

5—Retail merchandising activities which represent $53,000,000,000 a year.

6—A rainy day provision made by our people for themselves representing $27,000,000,000 deposited in our savings banks.

7—More than $100,000,000,000 in life insurance to which our people added $1,250,000,000 in the first six months of the current year.

8—A stable currency system backed by an unprecedented gold reserve.

9—A productive capacity for mass output unrivalled in the past or present and a diversity of resources that enables us to satisfy a vast range of customers.

10—American investments abroad valued at more than $15,000,000,000.

In the face of this array of facts no American can justify economic defeatism; no business man can conscientiously be a "bear" as to the United States. Selling America short at any time is likely to prove a pretty perilous proceeding. It is particularly dangerous just now.

——— *F. M. Felker, Director, Bureau of Foreign and Domestic Commerce, U. S. Dept. of Commerce, before The Quality Bakers of America, New York, Nov. 30, 1931.*

Comfortable Homes

Industrial Bulletin of Arthur D. Little, Inc., interprets house-cooling problem

ALTHOUGH, in air conditioning, cold water for spraying is occasionally obtained from abundantly supplied deep wells, it is customarily obtained by electric refrigeration of tap water. This gives a prime efficiency of not over 15%. Furthermore, one ton of refrigeration (the melting of one ton of ice at 32° F.) removes only about 1% as much heat as the burning of a ton of coal produces. Consequently the cost of cooling, relative to that of heating, is usually staggeringly high to the general public.

Hence, a good deal of attention is being given to alternative, cheaper methods. A particularly promising development is that which makes summer air feel cooler by actually leaving it fairly warm but by removing most of its moisture. The well-established relationships between humidity and a feeling of bodily warmth are widely recognized. The public, moreover, has learned to dislike the clammy moisture of theatres which, in hot weather, are merely refrigerated.

Absorption Cycle

The absorption of the moisture is accomplished by passing air, which has been cooled somewhat and cleansed by spraying with tap water, through silica gel or other absorptive materials. The peculiar nature of such materials enables them to absorb many times their weight of moisture. After the absorptive material has reached its practical limit of absorption, the moisture is driven from it by heating with gas or fuel oil, and heat is removed from the dry material by piping tap water about it. This method has the advantage of having the absorption cycle accomplished by efficient, direct use of fuel, and refrigeration accomplished by relatively inexpensive tap water.

The extension of air cooling and humidity control to homes must await the further development of a refrigeration cycle produced by the correct application of inexpensive heat without the use of electricity. This need becomes apparent when costs are considered. To cool a six-room house to approximately 10° below the outside temperature, when the relative humidity is 50-60%, requires about six tons of refrigerating effect. This in turn requires about nine horsepower of electricity and eighteen to thirty-six gallons of water per minute. Direct operation costs, even at the low rate of four cents a kilowatt for electricity and a dollar a thousand cubic feet for water, would then be $6.20 for a ten-hour operating day, or $186 a month. Gas-operated devices now under development show promise of cutting such costs to about $40 or $50 a month. At such a figure the rapid acceptance of domestic cooling will be assured.

As the manufacture of refrigerating effect under any conditions will always be fairly expensive, heat losses entailing a burden on the heating system, that are casually passed over in the winter time, cannot be neglected in summer cooling. Therefore, when cooling is adopted, all windows will not only have to be reasonably tight, but they will probably have to be shaded against the radiant effect of the sun. Most roof areas are now almost devastating in connection with cooling, and rooms exposed to uninsulated, unprotected, and dark-colored roofs must be much better protected before effective and economical cooling can be accomplished.

In the ordinary domestic installation the equipment must be safe and practically fool-proof, require no attention, and operate noiselessly, uninterruptedly, and with the maximum economy. At the present time, circulatory systems with the accompanying ducts, sprayers, motors and control can be bought and installed without power refrigeration for approximately three to four hundred dollars a room. An electric refrigerating unit of six tons capacity would cost from four to five hundred dollars a ton installed today. The average six or eight room house equipped for domestic cooling with all the major devices required would thus entail an installation cost of from five to six thousand dollars. Its direct operating cost, as has been noted, would be from $150 to $200 a month during the cooling season. In a new residence, about half of the initial cost could be charged against the winter air conditioning system.

With so few systems in use at the present time the problem of an adequate water supply is not a major one. When the use of refrigeration for cooling purposes becomes general, however, the quantity of water essential to its proper operation for condenser purposes would be a much greater load on the water supply of the locality than any one present factor. The use of domestic cooling towers, which would remove the heat developed in the cooling process by evaporating a portion of the water, would then become necessary for water conservation.

The immediate future of domestic summer air cooling, particularly in houses already built, thus seems confined to restricted portions of homes, such as living and dining rooms. Such local systems can also be designed to add the humidification which is so essential to winter health and comfort.

The developments now taking place in summer air conditioning, the public attention to moving-picture theatres, department stores, railroad cars, and banks equipped for summer comfort, the ever-increasing demand for winter humidification, and the attention being given this field by strong industrial and utility groups, all make it seem likely that adequately designed, domestic summer air conditioning apparatus will be marketed on a large scale within the next five years.

Do Not Confuse Air Conditioning With House Cooling

OUR efforts should not overlook future possibilities of house cooling and as far as practical, heating plants should be laid out with the thought of its later incorporation. We should be careful as to what we call house cooling, and not allow either ourselves or our customers to be confused by the statements of some manufacturers who claim to have house cooling equipment which in reality is nothing but an air washer. Air washing equipment is being advertised and sold by a number of manufacturers who are coupling with it the thought of house cooling. Such claims are going to be the biggest retardation to house cooling we are apt to encounter. The failure of air washers to do what the purchaser expects when the words house cooling are used, is bound to be damaging to real house cooling when it actually arrives..—*E. C. Whitcomb before Second Southwest Regional Gas Sales Conference, Hot Springs, Ark., Nov. 16-17, 1931*

Dealer Cooperation in Oklahoma

A Tulsa window trim that brought them inside

W. Jennings Young of the Oklahoma National Gas Corporation Adds to the Load Despite the Relinquishment of Gas Appliance Merchandising

W. B. STODDARD

CAN a big public utilities corporation forge ahead, in the face of depression, and without the aid of merchandising appliances, show an increased volume of business over that of the previous year? *It can be done.* The Oklahoma Natural Gas Corporation is a shining proof of the ability to show a healthy growth without being in the appliance trade at all.

W. Jennings Young, head of New Business for the Tulsa district, gave some interesting sidelights on the intensive campaign that is being waged to sell the idea of efficient gas heating to the public:

Closing Out Appliances

"During the February, 1931, session of the Oklahoma state legislature a law was passed forbidding any public utilities company to engage in the sale of appliances of any kind. July 11 was the last date on which any purchases could be made, but a reasonable time was allowed in which to dispose of the stocks on hand. Thinking it best to get it over with as soon as possible, we, with the approval of the merchants in the various cities of Oklahoma served by our company, put on big sales in Oklahoma City and Tulsa, offering liberal discounts on all appliances, and in six weeks disposed of a $75,000 stock. In doing this we used no direct mail, but made use of extensive window displays and newspaper advertising, together with some radio talks. In all of these we explained that we were going out of the merchandising business, and that therefore the low prices offered on the various items indicated no cheapening of material, but merely that we wished to dispose of our entire line at as early a date as possible.

"Having thus cleared the decks we prepared to aid the merchants in each city—furniture, hardware, and department store men, plumbers, contractors and architects, in fact all who sold appliances—to increase their sales of these items. A representative in every city served by the gas company called upon the leading merchants and requested that they participate in a co-operative plan. What was done in Tulsa was done in all the other major cities, on a scale commensurate with their size.

"We planned four special campaigns. In August and September, central house heating plants; November and December, space and circulating heaters; in the spring, April, hot water heaters; and in May, gas ranges. During each of these campaigns the gas company carried extensive ads, sometimes full page, suggesting these appliances, and advising that they consult with their local dealer regarding same. In our advertising we said 'For advice regarding your heating problems, call upon us; for appliances, see your local merchant.' During these campaigns our windows had inviting displays of the heating apparatus being featured, the backgrounds being supplied by us, and the appliances furnished by the dealers, whose cards were attached to their heater. Large cards always advised prominently, 'See your local dealer for any new gas appliances.'

Public Relations Bettered

"This non-selling plan has improved our public relations immensely, and we now have the active co-operation of the merchants who are selling appliances. We have more salesmen now in the field assisting local dealers than we had when we were in the merchandising business ourselves. Our field of operations is divided into 11 districts, and we have 27 men in our new business personnel.

"We have a special class each Monday evening for plumbers, contractors, architects and all interested in building operations. This is in charge of T. G. Store, house heating engineer, who talks to them on the most economical methods of house heating, and also how to scientifically calculate the heating apparatus necessary to comfortably heat any given home or building. The commercial heating men are quite interested in these classes and they have been well attended since they started. We have also held several meetings with merchants, though not at regular intervals, to talk over their problems and help them to increase their appliance sales. When we decide to hold one of these meetings our city salesmen call upon the appliance merchants and invite them to attend a conference in the offices of the gas company. At the last meeting 15 of the representative department store, hardware, furniture and house-

hold appliance managers or buyers attended, and a number of plans were suggested.

"In each city a dinner has been held, given by the representatives of the local gas company to the merchants, plumbers, contractors, architects and others interested in merchandising gas appliances, and here plans for a closer co-operation in selling gas appliances are brought out.

"Another plan that meets with the hearty co-operation of the merchants is that of displaying their appliances on the main floor of the gas company, where our own appliances were formerly shown. In Tulsa and Oklahoma City, where there are so many appliance merchants, it is necessary to limit all the firms to one appliance each, but in the smaller cities the merchants sometimes have three or four appliances on view. The appliance must also be appropriate to the campaign which is being waged at the time—i. e., when central heating plants are being featured, gas furnaces of this type must be shown; when ranges are being advertised, ranges must appear on the floor. Each appliance is tagged with the name of the firm, and usually he has near it a pile of circulars bearing his address and a description of the heater.

"At the expiration of the two months the appliances on the main floor are transferred to a much larger room on the second floor, where they form part of a permanent exhibit, so that a prospect for any type of gas heating apparatus can find something to suit him in the complete line on view in the big display room.

"There is a special man assigned to help the merchants with their gas appliance sales problems, supervise their advertising, and even assist in arranging attractive window displays."

What has been done in Tulsa has been and is being done in all the districts served by the gas company. In Okmulgee, Oklahoma—a city of 25,000—for instance, two big receptions were held at the display rooms of the O. N. G. Corp, on the evenings of Tuesday and Wednesday, during Gas Appliance Week. As in Tulsa, the local merchants displayed their wares in the gas company salesrooms, and in order to bring these displays to the attention of all citizens these receptions were held. Invitations were printed by the gas company and distributed to the ten participating establishments, a liberal supply being retained for their own use. These invitations were mailed out by the different firms to all their patrons, and in many cases these stores followed the example of the local manager of the gas company (Mr. Mooney) and penned a personal invitation to be present to the patrons whom they knew personally. An orchestra was engaged for both evenings, and all expenses of both receptions were borne by the utility. All the firms who had exhibits were on hand to greet their personal clientele, and a short talk on gas heating was given by an expert in heating. A similar reception, on a larger scale, was given in Tulsa, early in November and an intensive publicity campaign is being carried on all the time.

Dealers' Gas Appliance Purchases for 1931 Show 60% Increase Over Last Year's Figure in Brooklyn Union Territory

MAINTAINING their record for the 16th consecutive month, dealers in approved gas appliances in Brooklyn and Queens during October purchased more appliances from this company than they did in the corresponding month of the previous year.

Last month's figures reveal that dealers bought nearly $50,000 worth of gas-burning equipment, an increase of 37 per cent over the total for October of last year. The figure is the second highest for any month since the dealer-cooperation program was instituted 28 months ago.

Comparative figures follow:

Dealer Purchases, October, 1931	$49,745.78
Dealer Purchases, October, 1930	36,311.13
Increase, 1931 (37%)	$13,434.65

October's sales to dealers raised the total figure for the first 10 months of the current year to $313,354.27. Compared with the figure for the corresponding period in 1930, the sum represents an increase of 60½ per cent over 1930's figures.

Dealer Purchases, First 10 M'ths, 1931	$313,354.27
Dealer Purchases, First 10 M'ths, 1930	195,180.68
Increase, 1931 (60½%)	$118,173.59

As early as September 30th dealers had purchased more appliances this year than they did during the whole of 1930. The 1930 total was $239,596.78.

Although sales to dealers have shown a remarkable increase, an even greater rise has taken place in sales resulting from leads turned in by dealers. This class of business has increased 86 per cent, which means that it has nearly doubled. The figures are:

Sales Thru Leads, First 10 M'ths, 1931	$195,447.33
Sales Thru Leads, First 10 M'ths, 1930	104,859.89
Increase, 1931 (86%)	$90,587.44

October's sales through dealers' leads showed a smaller increase over last year than has generally obtained, but even so a gain of 27½ per cent was shown. The lower percentage of gain is due, probably, to the fact that October was the highest month last year in sales resulting from dealers' leads.

Sales Thru Leads, October, 1931	$31,591.86
Sales Thru Leads, October, 1930	24,775.90
Increase, 1931 (27½%)	$6,815.96

A summary, showing the types of appliances purchased by dealers during October follows:

General	$128.43
Cookers and Ranges	14,635.43
Refrigerators and Refrigerator Units	28,615.06
Water Heaters	3,587.33
Central House Heating	1,163.04
Radiators	1,325.81
Radiant Type Heaters	204.62
Industrial	86.06
Total	$49,745.78

Answering the Call

Scattered Symptoms Which Should Develop Into a Heartening Pandemic

Gas Company Provides Jobs for 80 Men for One Week Out of Four

"Mac," of the Bridgeton Evening News, interviews Jacob B. Jones

MY boss called me in the front office yesterday and said, "Mac, you had better run over to the gas office and see Jake Jones; he's rung the bell again; made a hit or something."

"What has he been doing now, more pumpkin or bought a circus?" I asked.

To which he replied: "I don't know, but here is the proof of an ad which slipped in here quietly and unannounced, and it looks to me as if he is up to his old game of 'batting for the home team,' and it will make a cracking good Thanksgiving story, so, Mac, you just run along and get it."

"Mr. Schofield asked me to come over and see you about this employment ad we are running Wednesday afternoon," I began. "We are wondering if it is to help relieve unemployment or whether you're getting ready to do necessary work."

"For the past 20 years," said Mr. Jones, "our company has been extending its mains to meet new building developments in the city of Bridgeton; not only to meet them, but to keep ahead if possible.

"The city has paved several miles of streets. There has been so much of this work that we have postponed the usual testing of our underlying structure, and now we would like to prove up our mains on unpaved streets. The Gas Company has no idea of securing new business. We simply want to stop the loss due to gas leaks in the streets, due to natural contraction and expansion, also the increase of heavy traffic. This seems to be a good time to do it.

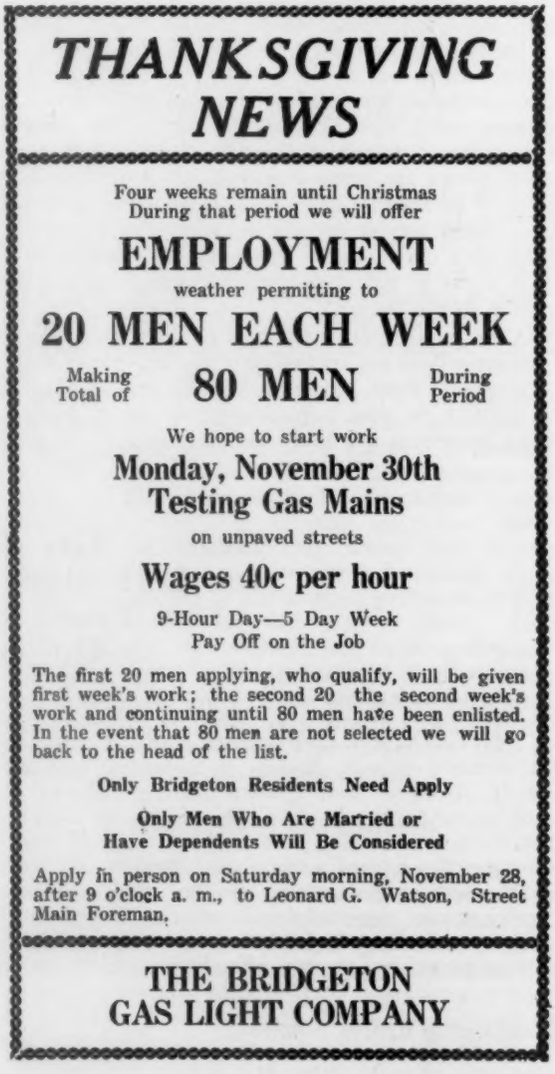
"There is nothing much to be said about it; we are selling gas at the lowest possible price. The reduction to us in the price of coal has been passed on to the consumer of coke, where it properly belongs."

Then he told me of the plans which had been made to commence work on Monday of next week, and pointed to the details of registration and employment in the ad in another part of today's News.

The plan is to give 20 men a week's work and in the four weeks to provide employment for 80 men. The wages are 40 cents an hour for a nine-hour day and a five-day week.

The job will provide for an expenditure on the part of the Gas Company of approximately $1,440 in labor and approximately the same in materials and equipment. Nearly 10 miles of gas lines will be tested out between now and Christmas, all of which will be a timely contribution to the employment situation, but which might be taken care of very well by the regular gas company organization over a longer period.

"And, if we spend $3,000 in giving employment to labor, between now and Christmas, it will just flow back to our own home town folks," said Mr. Jones, and the interview was closed.



THANKSGIVING NEWS

Four weeks remain until Christmas
During that period we will offer

EMPLOYMENT

weather permitting to

20 MEN EACH WEEK

Making Total of 80 MEN During Period

We hope to start work

Monday, November 30th
Testing Gas Mains

on unpaved streets

Wages 40c per hour

9-Hour Day—5 Day Week
Pay Off on the Job

The first 20 men applying, who qualify, will be given first week's work; the second 20 the second week's work and continuing until 80 men have been enlisted. In the event that 80 men are not selected we will go back to the head of the list.

Only Bridgeton Residents Need Apply

Only Men Who Are Married or Have Dependents Will Be Considered

Apply in person on Saturday morning, November 28, after 9 o'clock a. m., to Leonard G. Watson, Street Main Foreman.

THE BRIDGETON GAS LIGHT COMPANY

The Jourdan Employment Plan

The Brooklyn Union Gas Company Provides More Jobs. New Plan Will Give Work to Four Hundred.

WITH adoption of a new schedule of working time, The Brooklyn Union Gas Company is enabled to give employment to four hundred additional persons. The essentials of the six part plan are as follows:

1. Employees, as far as possible, will be put on five day week.

2. Company will share burden of employees who go on five day week,—the six day week employees will work five days but will be paid for five and three quarters days.

3. Company will make suitable cash contribution to Emergency Relief Fund.

4. Employees affected by shorter week of employment will not be solicited for cash for relief purposes. Their contribution is work.

5. Employees not affected by shorter week are expected to contribute cash to the Emergency Relief Fund, to the extent that their contribution shall equal that given by the other employees in work.

6. This plan is to operate tentatively December 1, 1931, to June 1, 1932.

This plan meets three leading problems of the unemployment situation, namely,—redistribution of work, to provide work for more people; employee contribution of cash; and Company contribution. Most of the Company contribution goes through the employees, which enables both Company and employees to furnish more jobs.

The idea is based on several undisputed considerations. Among them are:

1. Money is needed for immediate use, to meet a serious situation, the existence of which is recognized by everyone.

2. Jobs are even more needed than money. FIFTY CENTS WORTH OF WORK IS WORTH A DOLLAR IN CASH. Cash will tide over this winter, but redistribution of work offers the only possibility of permanent cure.

This plan permits employment of about four hundred additional persons. At present, there are about two hundred people on the Company payroll, who without such an arrangement, would have to be laid off. By this means, work is provided for them and for two hundred more people.

With the present payroll of 4,500 people, additional jobs are thus provided for one person out of every ten now on the payroll of The Brooklyn Union Gas Company.

3. Employer and employee, all people with jobs, must help.

4. Direct solicitation of employees, if effective, thorough and equitable, may become coercive.

5. Business must be run after emergency is handled.

6. Employee should welcome this form of participation because his contribution provides double value, since he loses but one-fourth day's pay but gives a full day's work to another.

7. Employee actually receives increase in rate of pay per hour.

8. Company makes largest contribution by this increase, but makes it through its own employees.

9. Company retains loyalty of entire organization.

10. Companies having the highest per cent of normal activity and operation should be able to absorb more idle labor than other industries which are almost shut down.

11. Losses in general efficiency should not be serious; only qualified people can be employed, and the Company may safely assume its only material loss will be the material increase in rate of pay to present employees.

12. New employees have same status as present employees with respect to sick benefits, insurance, and pensions.

13. All jobs cannot be handled in this manner. Only what may be termed group jobs lend themselves to this plan.

14. By reason of the contribution of the employees as well as the Company, and this rearrangement of employment, the aggregate value to the Community, in unemployment relief is substantial.

Help Wanted!

ILLINOIS GAS COMPANY TO EMPLOY MORE MEN AS FAST AS INSTALLATIONS MAKE IT POSSIBLE IN SUMNER, BRIDGEPORT, OLNEY AND LAWRENCEVILLE

Any gas consumer now unemployed is offered the opportunity to work out his gas bill or appliance account.

In addition to the above offer, and in order to make it possible to

EMPLOY MORE MEN

BEGINNING TODAY gas appliances, including new ranges, heaters, water heaters, gas heaters, gas furnace burners, etc., will be sold on a non-profit sales basis. Therefore, your purchases during this Non-Profit Sales Campaign will do this: ——————————

1—Bring big savings to you.
2—Increase your home comforts.
3—Materially assist employment—jobs take the place of donations.
4—Work created—reduces charity need.
5—Make you a contributor in the better sense. Prices are on the up-trend.

NEW GAS MAINS NEEDED

As fast as possible, new mains that ordinarily would not be laid until spring will be started. This will keep men employed. With gas cheaper now than ever before, if you are planning to install GAS, your order now will create new jobs. Also you will save money, as no charge will be made for appliance installations ,even to making connections and running pipe lines from your meter.

IF YOU BUY WHAT YOU NEED WE WILL EMPLOY MORE MEN

—Terms will be extended to all purchasers if desired—

This plan is open to your closest inspection and approval. It also has met the approval of Associated Charities.

This plan has already given employment to several, some are now working full time. Any questions or further information will gladly be given.

This advertisement ordered published and paid for by

Illinois Gas Co.

T. W. LOGAN, Manager

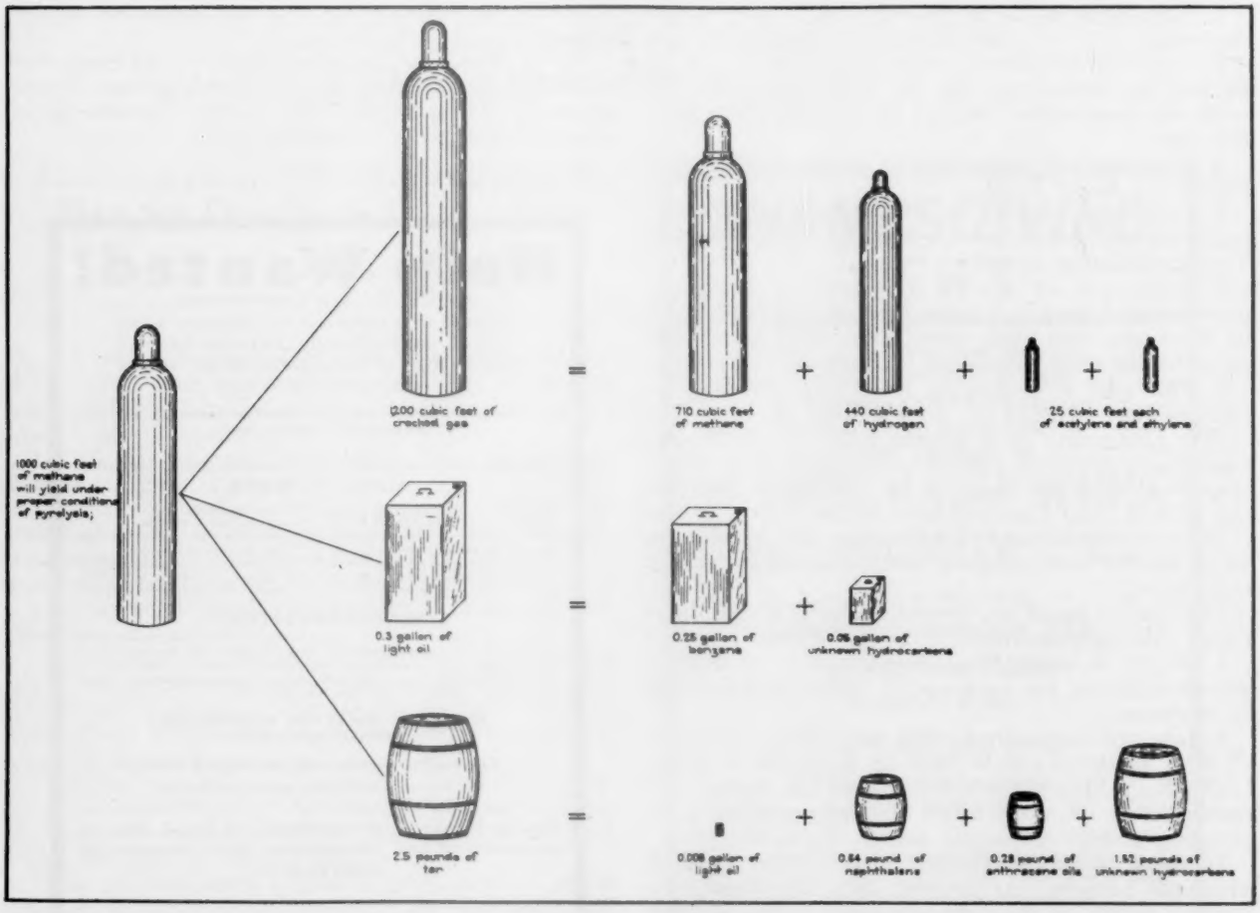
This plan, or a similar one, if adopted by all businesses, through co-operation would make it more effective, increase employment and give people a chance to pay their bills. NO REAL AMERICAN WANTS CHARITY. 95 percent of the people want to pay their bills.

Motor Fuel From Natural Gas

THE development of a commercially practicable method for converting natural gas into liquid products, particularly motor fuels and solid by-products, is the object of an investigation being conducted by the United States Bureau of Mines, Department of Commerce.

The best average results so far obtained in this investigation from 1,000 cubic feet of methane are approximately 0.3 gallon of light oil, largely benzene, 2.5 pounds of liquid tar containing about 35 per cent of naphthalene and anthracene and 65 per cent of unknown hydrocarbons. In addition there remains about 1,200 cubic feet of gas containing 710 cubic feet of methane, 440 cubic feet of hydrogen, and 25 cubic feet each of ethylene and acetylene. This residue gas has a calorific value of 775 gross B.t.u. per cubic foot at 60° F. and 30 inches of mercury.

The presence of small amounts of ethane (5 to 15 per cent) as generally found in natural gas, increases the yield of liquid products markedly. Inert diluents, such as nitrogen, have no adverse effect unless present in large amounts. Hydrogen tends to depress the



yield, whereas acetylene and ethylene cause an increase.

The data obtained in this investigation point to certain general conclusions which give further evidence of the commercial application of the method of pyrogenic synthesis of gaseous, liquid, and solid hydrocarbons from methane. No attempt has been made to compare the results with those of other investigators because the data are not on a comparative experimental basis, and because there are some contradictory results concerning which the experimentors at the Petroleum Experiment Station wish more confirmation. Nevertheless, the following items are given as the present findings of major importance from the work done with relatively small-scale apparatus, which are described in the report:

The pyrolysis of methane yields (exclusive of carbon and hydrogen) higher hydrocarbons, among which the following have been identified: Ethylene, acetylene, benzene, naphthalene, anthracene and pyrene. Besides ethylene and acetylene, other gases are produced in small amounts, among which methyl acetylene is suspected. There are also formed unsaturated liquids boiling below and above benzene, and liquids and solids of very high boiling point, presumably high in carbon content.

The yields of these products obtained from methane at atmospheric pressure depend on the temperature and rate of flow through the cracking zone, assuming other factors equal. However, an increase in duration of heating is not equivalent in all respects to an increase in temperature.

Ethylene appears to be the dominant factor at the beginning of the pyrolysis, the other hydrocarbons being formed subsequently; but it is impossible to determine yet whether the light oil proceeds from ethylene or acetylene.

Dilution of the gas with either nitrogen or hydrogen affects the yields, probably due primarily to heat transfer and polymerization. In addition, hydrogen decreases the yields due to suppression of the dissociation of methane. With both diluent gases the per cents of ethylene and acetylene in the total products are increased.

Ethane admixed with methane increases the yields of all products considerably.

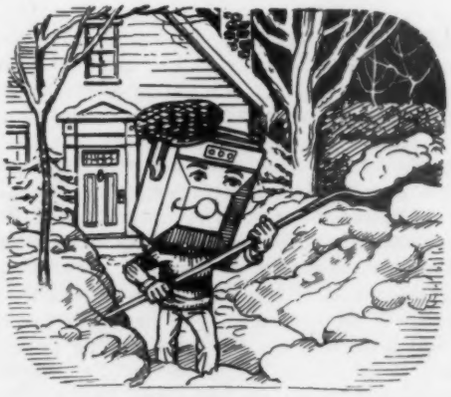
Certain relationships between the yield and the variable factors of temperature and rate of flow have been found to exist.

The optimum operating conditions may be approximated by a consideration of the rate and amount of production.

Further work is in progress on a larger scale laboratory basis to show more fully the effect of such factors as diameter, length, and material of heating tubes; preheating of incoming gas; and subsequent treatment of the exit gas as it emerges from the cracking zone of the equipment.

Additional information in regard to the results thus far obtained in this investigation is published in Bureau of Mines Report of Investigations 3143, "The Production of Motor Fuels from Natural Gas—I, Preliminary Report on the Pyrolysis of Methane" by H. M. Smith, Peter Grandone, and H. T. Rall, which can be obtained without cost upon application to the United States Bureau of Mines, Washington, D. C.

AMERICAN GAS MERCHANDISING ALMANACK



1932

January

THE Editor of the ALMANACK wishes every gas man in this broad land and everywhere else a Merry Christmas. May the New Year find you all braced up to do a bang-up job in 1932.

January is the month of the garnet and the snow drop. The month may be symbolized in your displays by the use of Father Time, the hour glass and the babe. We hope this New Year's Day will find the gas man in a most optimistic frame of mind. If he has any repentances we trust that he will have cast them off on December 31 and thereby approach the dawn of a NEW YEAR with the same courage and will to do that has prevailed and developed a small flickering flame produced in Peale's Museum into a great industry known as the gas industry today.

New Year's Day finds a great many northerners packing their duds for a sojourn in the south, while it finds countless others devising ways and means to secure a little more comfortable home for the "bad" weather that we are aware is just ahead. Many husbands who have had a taste of "playing fireman" are talking about and "betting" that next winter will not find them without a gas fired heating system.

In the home the great American purchasing agent is already thinking about and planning for spring, looking about for new home appliances she may purchase. .

Now, right now, the gas man should map out his sales plans for 1932.

1—Fri.	Happy New Year. Paul Revere born, 1735.
2—Sat.	U. S. flag first raised. **Gas men will rest and think about what they will do during the next twelve months to build sales.**
3—Sun.	Another day of rest
4—Mon.	**First work day of a new year; one wherein the gas man should actually get down to business.**
5—Tues.	Captain John Smith Captured, 1608. **Get merchandise on floor and in window if you are to have an inventory sale; if not, get new merchandise out.**
6—Wed.	**Get your newspaper advertisements to newspapers.**
7—Thurs.	Millard Fillmore, President, born, 1800. **Send out direct mail advertising. Talk over plans with force.**
8—Fri.	**Check-over results of newspaper advertising.**
9—Sat.	First shot fired in Civil War. **Have everything in shape to fire your first shot in your 1932 activity to secure greater sales per meter.**
10—Sun.	**Read your own advertisement in the Sunday newspaper. Have your family read it; ask them and ask yourself if it has the proper appeal.**
11—Mon.	Alexander Hamilton born, 1757. **Send newspaper copy to newspapers.**
12—Tues.	**Check-up on your window displays; find out if they have brought folks into your store.**
13—Wed.	Oglethope reached Charleston, S. C., 1733. **Look over your stocks; if you have any odd lots or high-priced merchandise get it on the floor, cleaned and priced ready to sell.**
14—Thurs.	**Talk to your floor salespeople; tell them what your plans for 1932 are and ask for their aid in cleaning up stocks.**
15—Fri.	**Check over newspaper advertisements.**
16—Sat.	**Again go over your stocks; look over and rearrange stocks of the sales floor. If you find that price has kept an odd item from moving take your loss now and get it marked to sell.**
17—Sun.	Prohibition went into effect, 1920.
18—Mon.	**Change your window displays; play up odd lots at special prices. Remember you are cleaning house.**
19—Tues.	General Robert E. Lee born, 1807. **Get newspaper advertising copy to newspaper.**
20—Wed.	**If you still have a lot of odds and ends on hand list them and secure their cost, and work out a p. m. system to move them.**
21—Thurs.	General "Stonewall" Jackson born, 1824. **Again go over floor stock and talk to salespeople about moving them.**
22—Fri.	**Phone prospects about "bargains" you have while they last.**
23—Sat.	**Get advertisement to newspaper for Sunday editions.**
24—Sun.	Gold discovered in California, 1848; the rush occurred in '49.
25—Mon.	**All set for the wind-up of your January activity. Talk about it and keep shifting your stocks until the end of the month.**
26—Tues.	**Again use the telephone to try to sell odds and ends at bargain prices to folks that have been putting off purchasing.**
27—Wed.	Kaiser Wilhelm II born, 1859.
28—Thurs.	**Only two more days—ask your salesmen to bear this in mind and to see and talk to every one possible.**
29—Fri.	Wm. McKinley, 25th President, born, 1843.
30—Sat.	**Sale of odds and ends is over. All set for a new activity in February.**
31—Sun.	Eddy Cantor, born, 1893. **Use the Cantor method in 1932—put a bit of joy in your selling.**

The Pendulum Swings Back; or, Will You Be Ready by January 1?

"THERE are three types of men in the world," said a man who has a long, wide and varied experience in the gas business; "they are the worker, the jerker and the shirker."

This statement was made some years ago by a man presiding at a gathering of gas executives held for the purpose of commending a young fellow, who had accomplished a task given him in a most thorough manner and in less time than had been allotted to do it. At the time the statement was made it did not impress us greatly, in fact we do not even remember that we ever thought of it again until along about 1920, and then only in a most casual way. It meant nothing to us until along late in the Autumn of 1919 during the days when the "buy me a hundred" boys began to sober up. Then it came back and began to stick and to associate itself with the selling end of the gas industry.

Selling as we viewed it had become the jerky one. Sales Managers were tearing up and down the Main Streets all over the land ballyhooing a great 30 day drive or pouring out a lot of hot words to a group of "One Call Kellys" in the morning meeting room.

Folks were buying, advertising men were knocking-out space fillers so fast and furious that it made the dear old public's head swim. Business was good—up to then.

The Pendulum Hits "High"

Manufacturers were "creating" many and sundry appliances, with all kinds of "appeals" to sell somewhere 'round two-ten, and flooding the mails and swamping the janitors with sales literature. The pendulum had hit HIGH and—stuck, so it seemed. Business was using hi-test and although the pilot was jerking and jumping from one big drive to another the old pendulum promised, to the unobservant, never to swing back. This condition sped up production, larger and bigger factories was the cry of the manufacturers; more men and bigger stores and warerooms was the cry of the retailer, and the user—oh! the user cried, "something new and novel."

The bubble expanded from the inner circle and took on a vari-colored hue; seven years of high-pressure had inflated most everything and everybody. Yet "what goes up must come down."

Gas men were selling bigger and better priced appliances galore; superlative advertising and sales promotion was reaching out on every hand and capturing the customers' cash for five year's hence to come. Jerking prevailed.

Any plan with a hunch seemed to succeed, yet as we all know the bubble was punctured. During the past few months the industry has been taking an inventory of men and methods and any number of pep-talkers of thirty months ago have become pencil pushers. Pencils have been sharpened in order to prove to principals that there is always a market and a need for sound salesmanship in the gas industry.

And that is what the selling head of the future is going to want to know pretty well before he undertakes any selling activity. Also, it is said that the man who directs sales in the future will not be chosen on his ability to paint pretty pictures before house-to-house men who have to visit Mrs. Consumer. He will be chosen because of his experience in marketing, his knowledge of markets, what people want, what they can pay for, how to enlist and train workers and keep them happy and working.

He will be the type of man who knows enough about all phases of selling home appliances to handle any phase of the work as a pinch hitter; how to instill in his men the profit to be made by wearing out shoe leather; he will know enough about advertising to plan or have it planned, not merely to follow the lead set by some other retailer whose set-up is, in nine out of ten cases, entirely different. This man will also know the value of advertising at the point of sale and how window display advertising is built and how store displays are tied into window displays and newspaper and direct advertising. He will have a hankering for statistics to the extent that he will want to have at hand at all times figures that show what is being sold, at what cost, and what revenue it is producing. The day has passed for promotion of several lines of appliances and it has just begun for others and this may bring about an entirely new basis and method of compensating salesmen.

"It has been decided by a number of executives that during the past six or seven years, they have not given the matter of supplying the needs of the buying public the thought they should have," said the sales manager of a large operating company a short time ago. "The gas men, like most men have been giving all of their time and thought and sales effort over to a market that may be said to have been a boom-time one and while in a measure, to the uninformed, it may have seemed a profitable one, it did not endure.

"To makes sales is one thing and to make replacements is another. When the gas company really supplies what the average family wants in the way of a good range at a fair price or a space heater or water heater at a price that fits the average pocket-book many new customers are added to their distribution system at a profit. On the other hand, when the gas man stages a bigger balloon race, conducts a slew of pep meetings and dishes out a raft of hurried advertising to the populace at large, featuring a padded step-ladder, a next-to-nothing down payment and monthly payments from now until the baby is old enough to work, and induces the home manager to throw out a perfectly good baker (gas range) and buy a baby-blue gas range, he is only swapping good money to build up a replacement business.

"We should go after NEW gas range business and we should replace old worn-out, not-regulated gas ranges and too, we should then drive hard to sell these range users automatic hot water service, gas refrigeration, gas incineration, gas heated garages, stores, factories, gas laundry dryers, and fire-place heaters.

"Some of these needed gas appliances have had wide acceptance but as a rule the line has not, simply because the appliance has not been continuously and consistently promoted and the reason for this is that there has been an over abundance of easy selling of the items that have been popularized."

The answer to the question: How shall we popularize, say automatic hot water service? is obvious; talk about it, have your salesmen talk about it, display water heaters in your windows, display them in ACTION on the floor of your salesroom, talk about them in the newspapers, through the mails and on painted bulletin boards and you will find that folks will want them, once you

show them just how essential hot water service is to their health and happiness. The same thing applies to laundry dryers, unit heaters, incinerators and gas refrigerators. You must talk about what they will do for the other fellow so long and so much that he will get the idea that he really has a need for these appliances and then—well, he will buy.

If you feel that any of these items need a new urge in the way of a special compensation for the salesmen, figure that out on a basis of revenue produced (cubic feet of gas consumed per year) instead of a per cent of cash price basis. This may be the answer to your problem. In figuring on a revenue basis, remember that this revenue goes on and on year after year, and adding another use for gas service to the home is pretty apt to sell additional appliances.

These are things that are being talked about today whenever or wherever gas men meet and as we view it, are the things that will find wide acceptance in 1932. Will you be ready?

Here's How

J. H. Manning and G. L. Cantrell, Portland (Ore.) Gas & Coke Company, Give Some Pointers on How to Build Sales Volume

Manning Methods

DURING the average day I call on from ten to twelve prospects. Whenever I feel conditions warrant it, I make evening calls. I do not feel that evening calls should be made unless a definite appointment is made as the entire evening is apt to be wasted as a result. Frequently I find that the lady of the house is able to make her decision regarding equipment if she so desires and that any such argument, as she'll have to talk it over with her husband, is usually just a stall to get rid of the salesman.

J. H. Manning

My "cold turkey" calls average from four to ten a day. I find these cold calls very profitable. A complete survey is made on each with the notation when to be returned. Then on the occasion of the necessary call back, or a special sale, they are invaluable to me as I have the complete situation of the customer's condition in front of me.

I seldom refer to our Salesfloor display unless I am actually working the Salesfloor, as at least 80% of my sales are made in the field with the aid of my portfolio. In the event of larger merchandise however, such as the furnaces and gas refrigerators, I make an exception and endeavor to bring a prospect to the Salesfloor at the time. I never allow the prospect to tell me that she will come in some time, but make an effort to induce her to come with me immediately.

Even though my prospect does not buy from me or anyone else, I never destroy the card, but keep it filed away to be used at some future time.

I never hesitate to sell the customer on our twenty-four hour service, our testing laboratory and what it means to her.

Cantrell Cues

I AVERAGE approximately fifteen calls per day and one or two in the evening, at least three times a week as I get a great deal of success in having both the husband and wife together.

G. L. Cantrell

My time is spent each morning first of all in segregating my prospects by streets so that I will not have constant jumping back and forth in the territory. I find the survey card made on each call a great help to me in securing new business. Oft times, even though it is months after the card is made out some little personal item that I had placed on the card gives me additional leverage in closing the sale.

At the start of the first cold spell and all special campaigns these survey cards calling for the particular appliances are returned to me, and a close follow-up is then made.

I find telephone solicitation is especially helpful. I realize perhaps 90% on tentative orders. Quite often the customer wishes to put her decision off until she can talk to her husband but yet will not allow me to call out and see him. I find that by getting her to sign the order then and there, subject to her husband's approval, has been quite a help. As stated before, within one to three days I will have received a call of at least 90% advising me to go ahead with the installation.

I am constantly working the life out of my satisfied customers. They evidently like close contact, for I find them a source of great information.

The great majority of my sales are made in the field. Of course, I use my car to advantage by bringing people in to the Salesfloor and then return them home, but as a result of this service I get the order.

One other real source of business is the realtors in my territory. I make it a point to contact some of these people daily and immediately learn from them, the renters and the new owners moving into my territory. A great amount of my merchandise and new business is obtained from this source.

I find that by tying in with special holidays, such as Thanksgiving and Christmas and by playing up our advertising that I increased my chances of obtaining more business.

Joint Advertising Campaign Increases Public's Interest In Gas Appliances

WILLIS PARKER

IN an effort to increase the "gas-mindedness" of the people of Los Angeles—city and county—a joint advertising campaign has been carried on for several months by the Los Angeles Gas and Electric Company, the Southern Counties Gas Company, and the Southern California Gas Company. Excellent results have been attained. Not only have consumers been made more conscious of the value of gas and the excellence of gas appliances, but also hardware, furniture and other retail dealers have been made more cognizant of their opportunities to sell gas appliances of the better sort.

The three gas companies have spent millions of dollars to bring to their customers natural gas of high B.t.u. content under uniform conditions. But in the final analysis, the utility of this fuel depends upon the appliances with which it is used. The mission of the joint advertising campaign, as it was explained, was to create a desire for, and cause the purchase of the new, improved appliances, so that consumers would enjoy all of the advantages of the fuel which engineering progress and capital investment had placed at their disposal. Increased consumption of gas would follow as a natural result.

Natural gas would have little competition for cooking, water heating, refrigeration and house heating in this territory if people were fully informed of the advantages of the fuel for these purposes. However, the gas appliances available five years ago did not present these advantages in their most favorable light. Not until about 1925 did the gas industry turn its skill and energy from engineering development to the refinement of domestic appliances, explained one of the committee administering the advertising campaign. Today, gas burning appliances for domestic use are unsurpassed, perhaps unequalled, for beauty and convenience.

Now the situation in the community was that all other fuels and appliances for use in these four ways were being actively advertised, and active selling campaigns were being conducted locally and nationally. Although the local gas companies were doing some advertising as individuals, the effort was not coordinated as closely as it might have been, nor was the advertising volume as great as it should be to break down the sales resistance being erected by the publicity and merchandising efforts of competing fuels and appliances. There has

NATURAL GAS HEAT — Convenience, Comfort, Health
GAS
HEAT
GUARDS
WINTER HEALTH
THERE are more things to health than heat, but the lack of sufficient heat often checkmates every other precaution. Cold toes are not necessary when there are so many convenient ways that natural gas can bring the warmth of Spring.
Provide now for winter heating. There is yet time before the "chill bogey" brings his winter supply of goose-flesh. There is a method of natural gas heating exactly suited to your home. Dependable, instant heat, at any hour in any room.
Consult your dealer, or gas company, on your house heating requirements. On the installation you adopt, look for the Blue Star Seal of the American Gas Association Testing Laboratory.
LOS ANGELES GAS and ELECTRIC CORPORATION
SOUTHERN COUNTIES GAS COMPANY
SOUTHERN CALIFORNIA GAS COMPANY
HEAR HELEN WEBSTER KFI 10:50 A.M. WEDNESDAY

Specimen of newspaper copy; size 6" x 13"

been some excellent coastwide, cooperative advertising; but its effort, being regional, required the support of an intensive effort in a more restricted territory to achieve maximum results. This was the problem.

An advertising fund of $117,000 was made available by the three companies for one year's effort. It is being administered by a committee composed of D. L. Scott, director of public relations of the Los Angeles Gas and Electric Company; W. D. Thurber, manager of publicity and advertising of the Southern Counties Gas Company; and F. H. Holden, supervisor of advertising and publications of the Southern California Gas Company. This committee not only outlined the campaign but also employed an expert advertising writer, John Spaulding, to prepare the copy, all of which is submitted to the committee and considered in detail before being placed.

The decision was to use approximately 39 column inches of space in each of the five metropolitan newspapers in Los Angeles each week; to use six "half-showings" of out-door advertising in Los Angeles county, each showing to last a month; to supply the commercial and industrial departments with direct advertising; to take space in a number of local trade journals; and place copy in 11 magazines of national circulation, such as "Atlantic Monthly," "Business Week," "Nation's Business," and "Review of Reviews." Through the national magazines it was sought to encourage more industries to locate in Southern California. Space in the local trade journals calls the attention of such prospects as builders, architects, contractors, industrial establishments, restaurants, etc., to the practicability of gas and gas appliances in their businesses.

Recognition was given hardware, furniture and other dealers who handled gas appliances, more or less enthusiastically, and their cooperation was obtained in a large measure by furnishing them with proofs of newspaper advertising and mats, and counter and window cards which were reproductions of the outdoor bulletin boards.

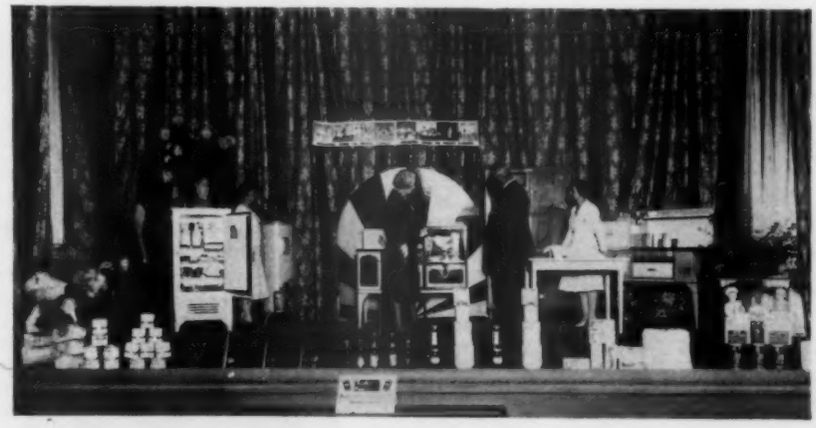
Newspaper and outdoor advertising carried the suggestion equivalent to "Ask your dealer or your gas company." In addition to this, newspaper copy carried the admonition, "Look for the Blue Star Seal of the American Gas Association's Testing Laboratories," as, for example, quoting from a water heater advertisement:

> "When you visit your plumber, hardware dealer, or gas company, look for the Blue Star Seal of the American Gas Association."

Thus, through the newspaper and outdoor advertising of the gas companies, whose signatures appeared on the copy, the lesser advertising efforts of individual dealers, the counter and window cards tying up with the outdoor advertising, the stuffers in statements and leaflets distributed by salesmen—all dwelling simultaneously on the same use of gas—a tremendous impression is being made upon the public mind.

The campaign is split into sections, or periods, of about six and a half weeks each, and one use of gas is stressed in each period—water heating, cooking, refrigeration, home heating. During the holiday season all uses of gas were mentioned and appliances suggested as Christmas gifts.

Butane Cooking School



Club women of Yreka inspecting gas appliances used at the Big Gas Cooking School. Left to right: Mrs. Margaret Nutling of the American Legion Auxiliary; Mrs. Edith Owens of the Parent Teachers Association; Mr. J. B. Knaack and Mrs. Wm. Cowan, former president of the Yreko Women's Club

CLUB Women of Yreka, California, have been quick to appreciate the many advantages of the new Air Butane Gas Cooking fuel which has been recently made available in that part of the state by Natural Gas Corporation of California.

For this reason they joined with the Daily Siskiyou News and the Broadway Theatre in sponsoring a most successful three day cooking school during October, which has been unanimously declared the best ever held in this community.

Classes were held under the direction of Miss Elner Martin, Home Economist for Natural Gas Corporation of California, with 124 in attendance the first day, the total growing to 194 on the last day. It is interesting to note that 63 of these ladies attended all three days of the school, 144 attended for two days and the balance for only one of the three days.

One of the new model automatic clock control gas ranges was given away the final day of the school, which helped to increase attendance. This was won by Mrs. E. Smythe, who owns a number of rental houses in Yreka and is one of the most enthusiastic gas boosters in the community.

The first day of the school was sponsored by the Parent Teachers' Association of the Yreka Grammar School and was given over to study of proper nutrition of the school child. Miss Martin ably illustrated how gas appliances make this task much easier than has been possible in the past.

The second day of the school was under the auspices of the Yreka Women's Club, and holiday entertaining was featured. Here again the use of gas appliances for novel and delightful refreshments was illustrated.

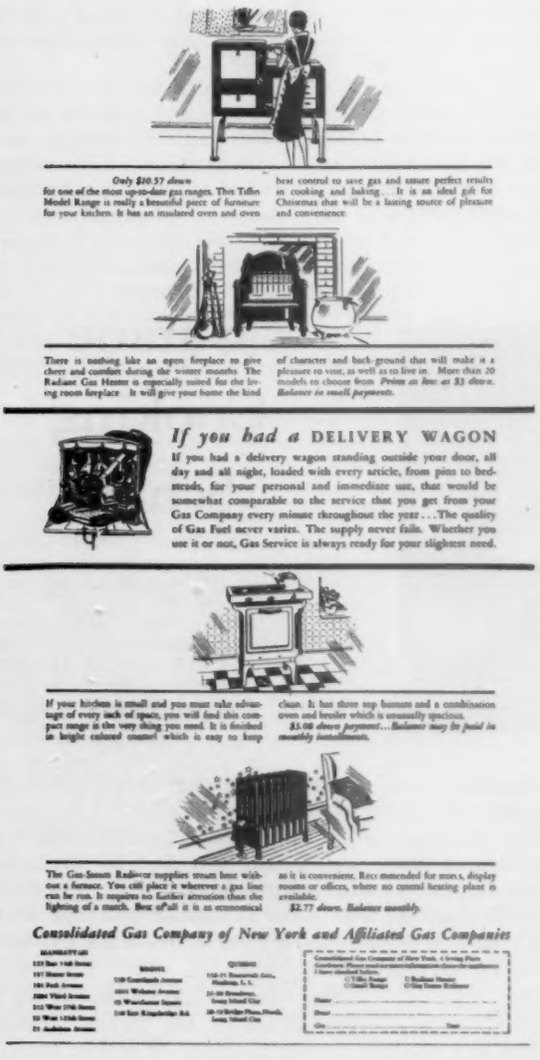
The final day was devoted to the proper cooking of meats and was sponsored by the American Legion Auxiliary, with the largest attendance ever had at a cooking school of this kind in Yreka.

On each of the three days the organization in charge furnished interesting entertainment features, including musical numbers, a short style show and a talk by Mr. J. B. Knaack who cleverly drew illustrations of the different methods of cooking employed in America with those in common use in Russia.

Members of the Domestic Science Department of the Yreka High School were brought to sessions of the School and all have joined in declaring it a most delightful one, with others to follow again next year.

Two Good Ones

FOR the advertising gas man who is ever seeking ideas we present two advertisements produced by the Consolidated Gas Company of New York and Affiliated Gas Companies. The advertisement featuring the five appliances is very unusual and very effective where "group" appliance advertising is to be done


Only $40.57 down
for one of the most up-to-date gas ranges. This Tiffin Model Range is really a beautiful piece of furniture for your kitchen. It has an insulated oven and oven heat control to save gas and assure perfect results in cooking and baking. It is an ideal gift for Christmas that will be a lasting source of pleasure and convenience
There is nothing like an open fireplace to give cheer and comfort during the winter months The Radiant Gas Heater is especially suited for the living room fireplace It will give your home the kind of character and background that will make it a pleasure to visit, as well as to live in. More than 20 models to choose from Prices as low as $3 down. Balance in small payments.
If you had a DELIVERY WAGON
If you had a delivery wagon standing outside your door, all day and all night, loaded with every article, from pins to bedsteads, for your personal and immediate use, that would be somewhat comparable to the service that you get from your Gas Company every minute throughout the year...The quality of Gas Fuel never varies. The supply never fails. Whether you use it or not, Gas Service is always ready for your slightest need.
If your kitchen is small and you must take advantage of every inch of space, you will find this compact range is the very thing you need. It is finished in bright colored enamel which is easy to keep clean. It has three top burners and a combination oven and broiler which is unusually spacious.
$3.08 down payment...Balance may be paid in monthly installments.
The Gas-Steam Radiator supplies steam heat without a furnace. You can place it wherever a gas line can be run. It requires no further attention than the lighting of a match. Best of all it is as economical as it is convenient. Recommended for stores, display rooms or offices, where no central heating plant is available.
$2.77 down. Balance monthly.
Consolidated Gas Company of New York and Affiliated Gas Companies

while the smaller one has a direct tie-in to the talk of the day—which always begets attention.

FASHION SAYS "Curves"
If you want to be in style this season, don't wear yourself to the bone taking care of a hand-operated furnace or water heater.
Protect your health and your figure by heating your home with
GAS
the EFFORTLESS FUEL
NEW YORK AND QUEENS GAS COMPANY
136-21 Roosevelt Avenue, Flushing, L. I. · Telephone FLushing 9-5200

Training Driver-Salesmen

A STRONG back is no longer the prime qualification it once was for the man who wants a job driving a truck, according to a survey just completed by the Policyholders Service Bureau of the Metropolitan Life Insurance Company. In fact, the report goes even further, and avers that the old-time husky driver is disappearing, and fast giving way to a new personage—the driver-salesman—a man who is a salesman first and a driver only incidentally.

The report prepared by the Metropolitan in cooperation with a number of companies in industries employing routemen—notably the food, ice, laundry, coal, beverage, meat, dairy, and baking industries—bears the title, "Training Driver-Salesmen." It describes the training methods that are being adopted to convert the one-time driver into a "merchandiser."

"Recently," says the report, "there has been significant progress in the training of driver-salesmen. A growing number of companies have adopted training programs, and not a few others have enlarged their training plans. One large corporation employs a professor of psychology, and a professor of salesmanship in one of the large universities, and many others employ special instructors and offer special training courses to help their routemen in their sales work."

Copies of the report may be had by writing to the Policyholders Service Bureau, Metropolitan Fire Insurance Company, New York City.

International Coal Conference Discusses Fuel Competition

AN EDITORIAL INTERPRETATION

COMPETITION between energy sources is an outstanding problem of the gas industry. Great importance therefore attaches to five papers which discussed in a fundamental way this problem as a part of the Third International Conference on Bituminous Coal held under the auspices of Carnegie Institute of Technology during November.

Much of value to gas men appeared in the papers, especially some from European engineers, on low-temperature coking, gasification, gas producers, and other subjects, but none of these have the broad and immediate concern which attaches to the general theme of fuel competition. For the present, therefore, American Gas Journal limits its report to a summarization in the language of the authors of this broad theme as presented by five speakers among the outstanding group of scientists and engineers who participated in the Conference last month.

Relationships of Bituminous Coal to Oil and Gas

W. T. THOM, JR.

Princeton University, Princeton, New Jersey

"AS we all know, the use of coal has been greatly curtailed in recent years because of the growing competition of petroleum and natural gas. If an impending failure of our oil and gas supplies were to threaten to end this competition, then perhaps the coal industry could hope for better markets in the near future without any effort on its part; or if the competition were to remain as at present, then in time the coal industry could perhaps reach an equilibrium. But if, instead of diminishing or remaining stationary, the annual output of oil or gas is to increase, especially if it be at a fluctuating rate, then the coal industry must take united and heroic measures to avoid disaster.

"What our undiscovered gas fields will yield, and what the deeper sands in some of the developed fields will produce is not now calculable, but I believe that the country's available gas reserves will amount to not less than 100,000,000,000,000 cubic feet, and may greatly exceed 200,000,000,000,000 cubic feet.

"The curve showing the rate of natural gas production in the United States, in the main resembles the earlier parts of the curves of coal and petroleum production, though the waste and exhaustion of gas in the old Indiana field, and the war disturbance, produced minor inflections not shown by the other curves. With our annual production and consumption of natural gas having already passed 2,000,000,000,000 cubic feet annually in 1930, it is to be expected that some one will soon raise the question as to how long our gas reserves can continue to meet such a growing demand. This phase of 'viewing with alarm' I trust we may now be spared. Undoubtedly the great development of natural gas pipe line systems has only begun and there will be correspondingly large increases in the rates of gas production and consumption. Within the not far distant future, however, the market for gas will approach saturation and, as costs of production rise, economies of use and the competition of coal will combine to give the curve of natural gas consumption a gentle downward slope.

"The coal and petroleum and natural gas reserves of the United States will certainly last beyond the lifetime of the present generation—that is to say, beyond that period for which prediction can be made as to what future industrial needs will be. Society may, then, feel safe from any sudden or drastic shortage in our basic sources of energy.

"We may also realize that the prospective great expansion of the natural gas and 'liquefied gas' industries will, in the near future, call for enormous tonnages of steel and for vast numbers of gas appliances of all sorts, and, further, that the cheapening and extension of electric service will also greatly expand the market for electrical appliances. Moreover, if the coal industry is restored to reasonable prosperity, hundreds of thousands of coal miners will again be able to buy motor cars and use gasoline. With improvement in the automobile business other thousands of automobile plant workers would also use motor cars again. If the oil industry has, meantime, been stabilized, the resulting increase in demand for gasoline will mean prosperity for oil companies, with more employment and more motor cars used in the oil field regions. And with automobile building revived, the steel and glass and rubber and textile industries will all feel a sympathetic revival, which ultimately will extend back into the building trades as well.

"Continuing depression in the coal and petroleum industries must necessarily greatly retard general industrial recovery in the United States, whereas the freeing of the oil and coal industries, from over-competition, and their restoration to orderly and profitable conditions, cannot but greatly accelerate the return of general prosperity and may even prove to be the decisive factor in turning the business tide.

"Conditions are bad, but they are not hopeless. Courage, an honest facing of the facts, group planning, and proration of coal production can revive the coal mining industry."

Future Possibilities of Bituminous Coal in the United States

WILLIAM A. FORBES

Assistant to President, United States Steel Corporation, New York, N. Y.

"THE possibilities of increased coal requirement by means of low temperature carbonization systems are not materializing as anticipated. While this phase of coal conversion has received much study and practical research, with the development of a multitude of processes and installation of an appreciable number of commercial sized plants, it can be said that the economics of this process have not yet been practically demontrated in the United States.

"The hydrogenation of coal, with which we are all familiar, in its application to the production of motor fuel from coal and also from tar and oil, has been frequently referred to as likely to lead to an increased demand for bituminous coal.

"So far as our country is concerned, this development is not likely to be the case, at any rate for a long time to come, considering the cost of installation and operation, and our enormous reserves and low cost of oil, and low conversion cost of oil into motor fuel.

"However, all countries are not as hap-

pily blessed as ours in these respects, and in countries where oil does not occur, and where coal is comparatively cheap, we are of the opinion there are good possibilities of hydrogenation of coal becoming commercially successful for production of motor fuel.

"Expert fuel technologists using engineering and applied science are increasingly active in recovering the maximum value and last B.t.u. of a dollar's worth of coal. Coal research has always yielded results, and in the continuation of it we are confident that chemistry, physics and engineering will develop increasing efficiencies favorable to coal and the maintenance of its position.

"Research in this laboratory has also extended to waste products from mining operations, such as conversion of waste dump material into saleable products, with result that it has been developed that calcined fire clay occuring as mine 'gob' can be commercially converted into high-class red roofing granules. Economical conversion of waste mine material to other uses is receiving similar attention.

"It will be noted that we have dwelt at considerable length on the use of bituminous coal in the coking industry. The reason for this is that the coking industry already occupies third place in point of gross consumption of bituminous coal, being exceeded only by railroad fuel and general domestic uses. Furthermore, in our opinion, the coking industry presents better prospects for extension of the use of bituminous coal than any other industry, with the possible exception of central power stations adapted to the economical use of pulverized coal or larger coal with modern stokers.

"In this paper, we have also necessarily shown how the use of bituminous coal has been steadily and appreciably adversely affected in recent years by other fuels and by the more efficient utilization of all fuels.

"For the future, we can visualize where the use of Bituminous coal may be extended by:

"1. Increased installations of by-product coke ovens and by-product gas ovens, with disposition of the resulting coke for metallurgical and domestic purposes; furthermore, attendant discoveries and developments of valuable by-products, as yet unknown, will undoubtedly ensue, as the result of the intensive coal research now in progress.

"2. Centralization of large unit power stations, suitably located as to present and prospective population requirements; also to natural resources of coal, with efficient operation in units modernly equipped for the economical production and distribution over tributary territory, of the power generated through the steam raising medium of pulverized coal or modern stokers.

"3. Development of gas producer design and efficient operation so that gas thus produced can compete with, and probably ultimately supplant, large quantities of fuel oil and natural gas, with resultant benefit to the Bituminous coal industry."

Per Cent Consumption of Various Kinds of Mineral Fuels in the United States

Year	Total Fuel Equivalent (tons) millions	Bituminous per cent	Anthracite per cent	Fuel and Gas Oils per cent	Natural Gas per cent
1920	668	76.2	11.5	7.5	4.8
1923	716	72.5	10.9	10.9	5.7
1926	757	70.4	9.1	13.5	7.0
1929	792	65.5	8.5	16.3	9.7

Based on total fuels equivalent consumed during the years of 1920 and 1929, an increase of fuel requirements of 124,000,000 tons is noted. Of this 124,000,000 tons increase, 10,000,000 tons is allotted to bituminous coal, but a similar decrease in anthracite consumption leaves the aggregate fuel in natural coal form at 586,000,000 tons, and the 124,000,000 tons increased fuel consumption is, therefore, divided between fuel and gas oil and natural gas.

Natural Gas and Coal Competition Between

R. B. HARPER

Vice-President, in charge of Research and Testing, The Peoples Gas Light and Coke Company, Chicago, Illinois

THE ever increasing demand for heat is being more or less satisfied by a corresponding expansion in the readily available supply of fuels or other sources of heat energy, which are, in the aggregate, growing greater in quantity and more diversified in character."

Comparison of the Approximate Estimated Supplies and Increases of Basic Energy Sources in the United States for the Years 1880 and 1930

Kind of Energy Supply	1880		1930		Increase 1930 over 1880	
	Equivalent short tons of coal*	Per cent of total	Equivalent short tons of coal*	Per cent of total	Equivalent short tons of coal*	Number of times 1880 supply
Anthracite	29,600,000	20.5	69,870,000	7.1	40,270,000	1.4
Bituminous coal	44,200,000	30.6	462,090,000	46.4	417,890,000	9.5
Total coal	73,800,000	51.1	531,960,000	53.5	458,160,000	6.2
Petroleum	5,130,000	3.6	226,000,000	22.7	220,870,000	43.0
Natural gas	40,000		83,500,000	8.3	83,460,000	2084.0
Water-power	320,000	0.2	85,000,000	8.5	84,680,000	265.0
Wood	56,000,000	38.8	60,000,000	6.0	4,000,000	0.1
Wind-power	1,080,000	0.7	1,080,000	0.1	—	—
Muscular power, (man, horses, mules, etc.)	8,125,000	5.6	8,880,000	0.9	755,000	0.1
Totals, etc.	144,495,000	100.0	996,420,000	100.0	851,925,000	5.9

* For other energy sources than coal, the equivalent short tons of coal is calculated on the basis that 25,000,000 B.t.u. of such energy is equivalent to 1 short ton (2000 pounds) of coal.

"While the above table shows such a rapid increase in the energy supply represented by natural gas to a value equivalent to a potential substitution of over 80,000,000 short tons of coal, sight should not be lost of the fact that water power is now potentially equal to the energy in about 85,000,000 short tons of coal and that the petroleum produced in 1930 had a potential heating value equivalent to over 220,000,000 short tons of coal.

"In general, the extent to which competition, or the lack of it, exists between the different fuels or potential heat sources, is dependent upon many considerations.

"Among some of the more important of these may be mentioned the following: (1) availability of fuel, (2) availability of equipment, (3) suitability of fuel, (4) suitability of equipment, (5) initial cost of equipment, and (6) operating cost."

Principal Items to Consider in an Estimate of the Cost of Utilizing a Fuel or Source of Heat Supply

1. Investment (including installation cost) for
   a. New equipment to handle fuel (shovels, chutes, stokers, cans, piping, for charging, etc.).
   b. New equipment to store fuel (bins, hoppers, containers, tanks, etc.).
   c. Equipment to prepare fuel (crushers, pulverizers, mixers, atomizers, etc.).
   d. New equipment to utilize fuel (furnaces, boilers, heaters, appliances, control devices, etc.).
   e. Equipment to remove residues (conveyors, machinery, tools, etc.).
   f. Equipment to store residues (bins, hoppers, conveyors, etc.).
2. Cost of conversion (including installation cost) of
   a. Existing equipment to utilize fuel (removal of parts, placing of conversion equipment, alterations, etc.).
3. Kind of fuel utilizing equipment, as to

Table B

CLASSIFICATION OF NATURE OF COMPETITION OF BITUMINOUS COAL WITH NATURAL GAS FOR VARIOUS USES FOR WHICH SUCH FUEL WAS CONSUMED IN 1927 IN THE UNITED STATES

ITEM	BITUMINOUS COAL		NATURE OF COMPETITION WITH NATURAL GAS
	Short tons consumed	Per cent of total	
Coal mine fuel	4,900,000	1.0	Non-competitive
Railroad fuel (all steam roads)	121,000,000	24.2	Non-competitive
Coke ovens (by-product and beehive)	74,426,000	14.9	Non-competitive
Bunker fuel (foreign and domestic)	6,051,000	1.2	Non-competitive
Total	206,377,000	41.3	
Local sales at mines, not shipped.	21,900,000	4.4	Partially or indirectly competitive
Coal gas and water gas manufacture	9,381,000	1.9	Partially or indirectly competitive
Total	31,281,000	6.3	
Iron and steel and their products (except machinery), gas and steam coal	25,789,000	5.1	Competitive
Electric utilities	41,888,000	8.4	Competitive
General manufacturing industries	106,856,000	21.4	Competitive
Domestic and all other uses	87,609,000	17.5	Competitive
Total	262,242,000	52.4	
Grand total	499,800,000	100.0	

a. Type (design, shape, character of use, etc.) and effect on operation.
b. Size (small or large unit, several small units in combination, etc.) and effect on operation.
c. Condition (leaks, scale, deposits, etc.) and its effect on operating cost.

4. Kind of chimney, as to
   a. Type (design, construction, material, etc.).
   b. Size (height, cross-section, etc.).
   c. Condition (leaks, deposits, stoppages, down drafts, etc.).
5. Fuel as to
   a. Cost per unit (including loss of fuel in transit).
   b. Heating value as fired or charged to equipment.
   c. Cost of storage (storage space rental, interest, losses of fuel in storage, etc.).
   d. Cost of fuel preparation (washing, crushing, pulverizing, etc.).
   e. Quantity required to do work or perform required service.
   f. Labor or other cost to charge fuel to equipment (fireman, operator, stoker, etc.).
6. Kind of operation of fuel-utilizing equipment, being
   a. Put into service (speeds and heats required with various fuels) as to operating cost.
   b. Continuous (as to effect thereof on operating cost).
   c. Variable as to load and as to effect thereof on operating cost.
   d. Intermittent as to effect thereof on operating costs.
   e. Put out of service (speeds required with various fuels) as to operating cost.
7. Draft conditions as to effect upon
   a. Stack or flue gases (heat carried away or lost) and effect on operating cost.
   b. Character of combustion (unburned fuel, smoke, soot, etc.) and effect on operating cost.
8. Refuse as to
   a. Sensible heat loss (in ashes, residues, etc.).
   b. Losses due to admixture with unburned fuel.
   c. Cost of removal (labor or power costs of removal from fuel-utilizing equipment, cost of trucking, railroad car or other means of removal from plants, etc.)
9. Cost of supervision as to
   a. Direct labor.
   b. Superintendence.
10. Cost of maintenance as to
   a. Fuel-handling equipment.
   b. Fuel-storage equipment.
   c. Fuel-preparation equipment.
   d. Fuel-utilizing equipment.
   e. Refuse-disposal equopment.

"In the table B about 41 per cent of the bituminous coal consumed in 1927 is classified as being non-competitive with natural gas, and over 50 per cent is shown as competitive, in varying degrees, with this gaseous source of heat.

"In the non-competitive group, we find such items as coal mine fuel, which may naturally be expected to consist almost, if not entirely, of coal. In this class, coal used as steam railroad locomotive and bunker fuel does not encounter competition with natural gas. Likewise, soft-coal, carbonized for the prime purpose of producing coke, does not feel any direct competition from natural gas in the production of such a commodity.

"On the other hand, more or less competition exists between natural gas and coal for most of the domestic and industrial heat applications. We find this gaseous fuel now used in industries concerned

Table C

ESTIMATED REPLACEMENT OF BITUMINOUS COAL CONSUMPTION IN 1930 IN THE UNITED STATES BY NATURAL GAS, FUEL AND GAS OIL, WATER-POWER AND OTHER ENERGY SOURCES

Based upon the assumption that bituminous coal would have maintained its upward trend in percentage of the entire energy supply in the United States from 1915 to 1930 (on rate of increase shown by soft coal from 1900 to 1915) if competition with the available supply of other kinds of energy sources had not existed due to rapid expansion in the use of these sources.

ITEM	CONSUMPTION IN EQUIVALENT SHORT TONS		PER CENT OF REPLACEMENT ENERGY SUPPLY	PER CENT OF TOTAL
Bituminous coal (estimated actual consumption in 1930)		445,000,000		65.6
Replacement natural gas (estimated actual consumption in 1930)	37,000,000		15.7	5.4
Replacement fuel and gas oils (estimated actual consumption in 1930)	82,000,000		34.9	12.0
Replacement water-power (estimated actual consumption in 1930)	82,000,000		34.9	12.0
Replacement miscellaneous energy sources (estimated actual consumption in 1930)	34,000,000		14.5	5.0
Total replacement energy		235,000,000	100.0	34.4
Bituminous coal (estimated 1930 consumption on basis of 1900–1915 consumption trend)		680,000,000		100.0

with the production of iron and steel products, in plants where electricity is generated, in the factories of all kinds of general manufacturing industries and in the homes of this country.

"Setting up the calculated data, we see in the table C, that of the theoretical loss of 235,000,000 short tons in 1930 in the consumption of bituminous coal from what it might be estimated to have been without competition from natural gas, petroleum, and water-power experienced from 1915 to 1930, only about 16 per cent can be directly attributed to natural gas competition, whereas fuel and gas-oils and also water-power each theoretically replaced about 35 per cent of the loss or a total of about 70 per cent, representing nearly five times that due to the gaseous fuel. The remaining 14 per cent may be considered to represent unclassified equivalent replacement coal loss in the form of natural gas and all other sources of energy supply other than coal.

"The table below attempts to compare the utilization by combustion of gaseous fuels, such as natural gas with the solid heat producing commodity—bituminous coal."

PRINCIPAL ADVANTAGES OF GASEOUS FUEL OVER BITUMINOUS COAL IN OPERATIONS INVOLVED IN THEIR COMBUSTION WITH AIR OR OXYGEN

1. *Delivery of fuel:*
   (a) No delays in delivery (no waiting for fuel when needed).
   (b) Any supply delivered instantly as required (necessary supply always on hand).
   (c) No losses of fuel in transit from point of measurement to point of delivery (loss of fuel from cars, trucks, etc. in transit).
   (d) No change in physical condition of fuel from point of measurement to point of delivery (breaking up or contamination of fuel by refuse, etc.).
   (e) No damage to surrounding property due to delivery of fuel (damage to vegetation, floors, walls, etc.).
   (f) No dirt or dust in air due to delivery.
   (g) No noise due to delivery.
   (h) No labor required on premises to handle delivery of fuel.
   (i) No notification ordinarily required to get delivery of fuel (telephone calls, purchase orders, letters, etc. unnecessary).
2. *Storage of fuel and ashes:*
   (a) No space required for storage of fuel or ashes (space available for rental or other purposes).
   (b) No investment necessary to provide storage facilities for fuel or ashes (no cost for bins, hoppers, containers, etc.).
   (c) No rental or expense for storage space or facilities for fuel or ashes.
3. *Handling of fuel:*
   (a) No or less investment necessary to handle fuel to equipment.
   (b) No or less labor required to charge fuel to equipment.
   (c) Greater flexibility in charging fuel to equipment (rate of burning easily changed over wide range).
   (d) No dirt or dust due to fuel handling on premises.
   (e) No excessive noise due to fuel handling.
   (f) No inconvenience or damage due to fuel handling (interference with domestic or other activities).
4. *Preparation of fuel:*
   (a) No investment for preparation of fuel necessary (no crushing, pulverizing, screening, equipment, etc.).
   (b) No labor necessary for fuel preparation.
5. *Condition of fuel:*
   (a) Greater uniformity in heat value of fuel.
   (b) Not subject to large variations in moisture content (coal sometimes containing much moisture, due to rain, etc.).
   (c) Not subject to contamination with miscellaneous foreign matter.
6. *Utilization of fuel:*
   (a) Greater flexibility in application of fuel (greater variety of flames or heat applications possible).
   (b) Greater range in temperature possible.
   (c) No smoke produced.
   (d) No labor required for ashes or clinkers formed (no barring of clinkers, shaking of grates, dumping of ashes necessary).
   (e) No soot, tar or ash deposits in fuel utilizing equipment or chimney requiring frequent cleaning and causing inefficient operation or damage to equipment.
   (f) No fly ash discharged from chimney or equipment resulting in damage, complaints, etc.
   (g) Much less sulphur in various forms discharged from chimney or equipment, resulting in damage, complaints, etc.
   (h) Less or no labor or supervision required in operating equipment with fuel.
   (i) Usually more efficient use of total heating value of fuel.
   (j) Fuel easier to ignite or start burning (no wood or auxiliary fuel needed to start operation).
   (k) Fuel easier to burn completely (no unburned fuel lost in ashes).
   (l) Less losses due to intermittent operations.
7. *Handling of residues:*
   (a) No investment necessary to handle ashes, soot, etc. (conveyors, shovels, soot removers, etc.).
   (b) No labor required for removal and disposal of ashes, soot, etc.
   (c) No expense for trucking or taking away ashes, etc. from premises.
   (d) No dirt or dust due to handling residues.
   (e) No excessive noise due to handling residues.
   (f) No inconveniences or damage due to ash, or soot handling.
8. *Payment for fuel:*
   (a) No payment usually made for fuel until after instead of before being used (gas is only paid for after it is all used, while coal is usually paid for before it is all consumed).
9. *Maintenance of fuel utilization equipment:*
   (a) Less maintenance, repair, or replacement of equipment parts necessary.
   (b) Maintenance service usually more readily available.
10. *Work performed or service rendered by fuel:*
   (a) Service rendered with no or less inconvenience.
   (b) Work more efficiently performed.
   (c) Work done or products produced of better quality.
   (d) No or less loss by inferior or rejected products.
   (e) Work done or service rendered more speedily.
   (f) Performance of work requires less attention and no hard labor
   (g) Performance of work may be accomplished under better working conditions.

Natural Gas and Bituminous Coal

GEORGE I. RHODES

Vice-President, Ford, Bacon & Davis, Inc., New York, N. Y.

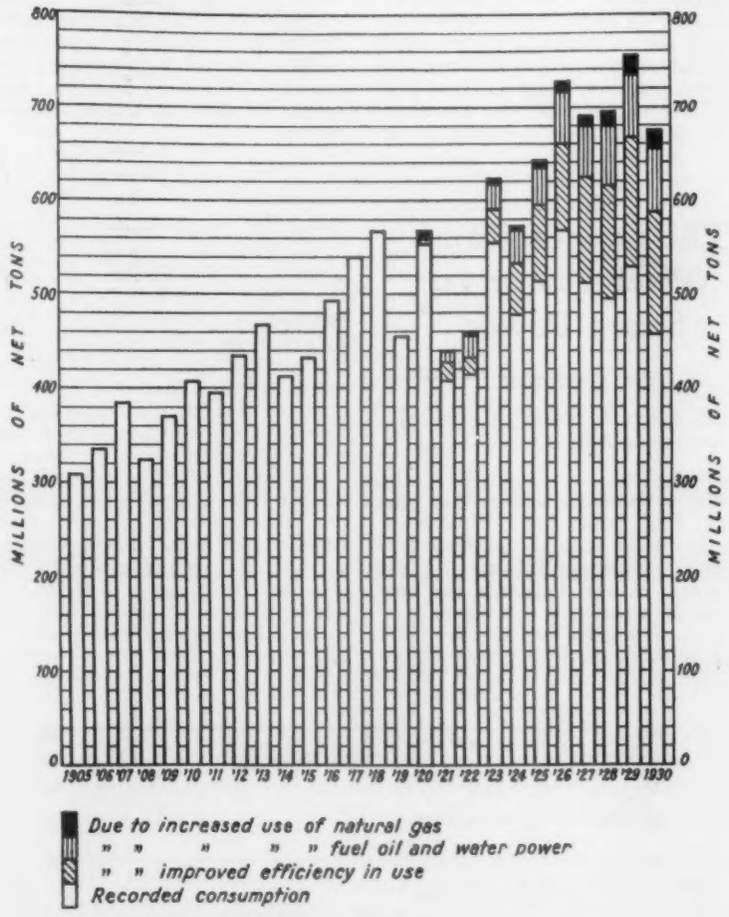
"NATURAL gas has for many years been a competitive factor in the bituminous coal industry and one of steadily increasing importance.

"Pipe lines now under construction or placed in operation since the year 1929 which showed the maximum consumption of natural gas, have an aggregate daily capacity of about 1,000,000,000 cubic feet. When these new lines are loaded to capacity there will be a further annual consumption of about 250,000,000,000 cubic feet or an increase of more than 25 per cent above the recent maximum consumption. Other lines are projected and it is reasonable to expect that there will be a still further large development of the natural gas business.

"Gas fields, the available reserves of which are now reasonably known, will support such increased consumption of natural gas for a sufficient period to attract new capital. Unless, however, there are large and important discoveries of new natural gas reserves it is difficult to see how new lines can be justified which will increase the consumption of natural gas to more than about double its recent maximum.

"Notwithstanding the large growth in use of natural gas, its competitive production is not large as compared with the production of bituminous coal. There is much speculation as to the amount of natural gas required to replace a ton of

coal and various conversion ratios have been used. It is a rare instance which requires as much as 25,000 cubic feet of natural gas to do the work of a ton of coal and there have been instances where as little as 15,000 cubic feet were required.


MILLIONS OF NET TONS
800
700
600
500
400
300
200
100
0
1905 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15 '16 '17 '18 '19 '20 '21 '22 '23 '24 '25 '26 '27 '28 '29 1930
Due to increased use of natural gas
" " " " " fuel oil and water power
" " improved efficiency in use
Recorded consumption

SOURCES OF DEFICIENCY IN BITUMINOUS COAL CONSUMPTION IN THE UNITED STATES SINCE 1919

Probably a generally dependable basis of comparison would be an average of 20,000 cubic feet per ton of coal. The maximum recent consumption of natural gas that could in any way be considered competitive with coal has therefore been equivalent to approximately 47,500,000 tons of coal per year or less than 10 per cent of the current bituminous coal production. The future natural gas consumption that can reasonably be foreseen would amount to a total equivalent of approximately 100,000,000 tons of coal per year or about 20 per cent of the present bituminous coal production.

"It must not be considered, however, that all of the natural gas consumption replaces coal. Much of it does replace coal but many of the large lines constructed in recent years have been built mainly with the idea of replacing fuel oil which for years had been the principal fuel consumed by the industries served. Furthermore, much of the increased consumption of natural gas has been and will continue to be in territory which has not been, to any considerable extent, a consumer of bituminous coal. Much of the natural gas used in the homes is for conveniences that were neglected before the advent of natural gas. For instance, in certain natural gas communities the average home uses gas having an equivalent of 400 to 500 pounds of coal during each of the summer months. It is difficult to conceive of the average home using such an amount of coal in the summer. Natural gas has gone into oil refineries in competition generally with fuel oil but occasionally in competition with coal. It has gone into the steel industry, most commonly replacing oil, in some instances replacing tar and, of course, in others replacing coal. It is difficult to estimate to what extent natural gas actually has or will replace coal but probably not over one-half of the gas consumption could be considered as truly competitive.

"In evaluating natural gas in terms of coal there must be taken into account not only all of the factors affecting combustion and the cost of the fuels but also the costs involved in handling, preparing and firing the fuel in the maintenance of the furnaces. In the case of boiler plants, taking the whole range from the smallest industrial boilers hand fired to the largest most elaborate installations involving water walls, air preheaters and economizers with pulverized fuel the value of 1000 cubic feet of natural gas as compared with $3.00 coal will range from 25 cents to 13 cents or from about 8 per cent to about 4 per cent of the cost of a ton of coal.

"The costs of production and transportation of natural gas are often misunderstood and published data frequently misinterpreted. Government statistics indicate that the average value of natural gas at the wells is about 9 cents per 1000 cubic feet. This has been converted into the equivalent cost of mining coal by the use of exaggerated minimum values of natural gas arriving at an assumed average cost of producing natural gas equivalent to $2.50 per ton of coal. This figure is certainly high as compared with the average cost of producing bituminous coal. The average value of natural gas at the well is a composite figure, the values in individual fields ranging from as little as 3 cents per 1000 cubic feet to as high as 25 cents per 1000 cubic feet. On the basis of average conversion factors, these values correspond to from $0.60 to $5.00 per ton of bituminous coal.

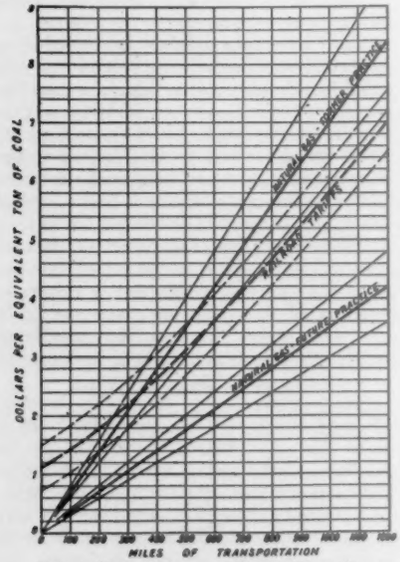
"Gas from the highest cost fields is generally used only in the vicinity of the field for those uses to which it has the greatest value. Gas from fields of average cost is transported for distances up to about 200 miles and is used largely in the homes and for those industrial purposes in connection with which it has a special value. Such average priced gas, of course, is used nearer the fields for less advantageous purposes. It is only the gas from the low cost fields that is generally transported for long distances and it is only such fields that need be considered as serious future competitors of the bituminous coal industry.

"In the natural gas fields the development of which through long pipe lines is most likely to affect the coal business in the future, the actual cost of producing gas aside from depletion, depreciation and carrying charges of the reserves may be as little as the equivalent of 20 cents per ton of coal. If the depletion, depreciation and carrying charges on the reserves are included then such costs of producing gas may be as low as the equivalent of 75 cents per ton of coal. Where there is the need, however, of unusually ample reserves as is the case with long pipe lines such costs may be equivalent to about $1.00 per ton of coal. These costs compare most favorably with the costs of mining bituminous coal.

"It has frequently been stated that it costs from three to four cents per 100 miles to transport 1000 cubic feet of natural gas. These figures have been converted to the equivalent coal costs on the basis of exaggerated minimum gas values and have been figured at from $0.84 to $1.12 per equivalent ton of coal per 100 miles. These exaggerated costs have been compared with freight rates on coal running from 50 to 60 cents per ton per 100 miles which at best are low coal tariffs. Such a comparison is most unfavorable to natural gas.

"The costs of transporting natural gas as well as freight rates are highly variable and are controlled by many factors other than the distance of transportation. The costs of transporting gas as well as freight rates vary not only with the character of

the country through which the product is carried but with the quantity which is transported and with many other factors. Railroad freight rates in many instances seem to be controlled by matters of expediency and competitive conditions as between mines and railroads for the service to a given market. The charges per ton per 100 miles for long hauls vary from as little as 39 cents to as much as 75 cents and for short hauls of 100 miles from as little as $1.00 to as high as $1.90. The frequently quoted natural gas transportation costs when converted on an average factor of 20,000 cubic feet per ton run from 60 to 80 cents per equivalent ton of coal per 100 miles. These costs are typically representative of practice only a relatively few years ago and cover all costs of transporting the gas with a return on the investment sufficient to attract capital.



RELATIVE COSTS OF TRANSPORTING NATURAL GAS AND COAL IN THE UNITED STATES

"Improvements in the art of transporting natural gas have been rapid and further improvements are on the eve of being adopted. Materials now available can, if skillfully applied, be constructed into pipe lines which can transport large quantities of natural gas at costs equivalent to 40 cents per ton of coal per 100 miles which is closely in line with the lowest selected freight tariffs now in effect. Further improvements in materials and design are likely to be made which will result in the possibilities of transporting natural gas for long distances in large quantities at costs as low as the equivalent of 30 cents per ton of coal per 100 miles.

"Perhaps a better picture of the relative costs of transporting coal and natural gas may be gained from the figure shown herewith. In that chart there is shown by heavy lines the relationship between the miles of haul, the average cost of transporting natural gas in the recent past and in the possible future and the present average freight tariffs. The spread in costs of transporting gas and in present freight tariffs is indicated by the lighter lines. The range shown by these lighter lines will include the majority of cases but there will always be cases of freight tariffs lower and higher than shown by the range and similarly gas transportation costs lower and higher than indicated.

"To sum up the situation, natural gas in spite of its recent rapid development has been but an incidental factor in the elimination of growth in the bituminous coal mining industry that has taken place in the last decade. So far as can be seen at this time it is not likely to become in the future a seriously important competitor to the bituminous coal mining industry as a whole. Former practice in the art of transporting natural gas limited its competition with bituminous coals to gas fields not appreciably further from the market than coal mines. New practices about to be adopted will make it possible to market gas from fields 400 to 500 miles more remote from the market than the coal mines. It is not possible to point out where such developments may take place."

The Economics of Water Power vs. Steam Power

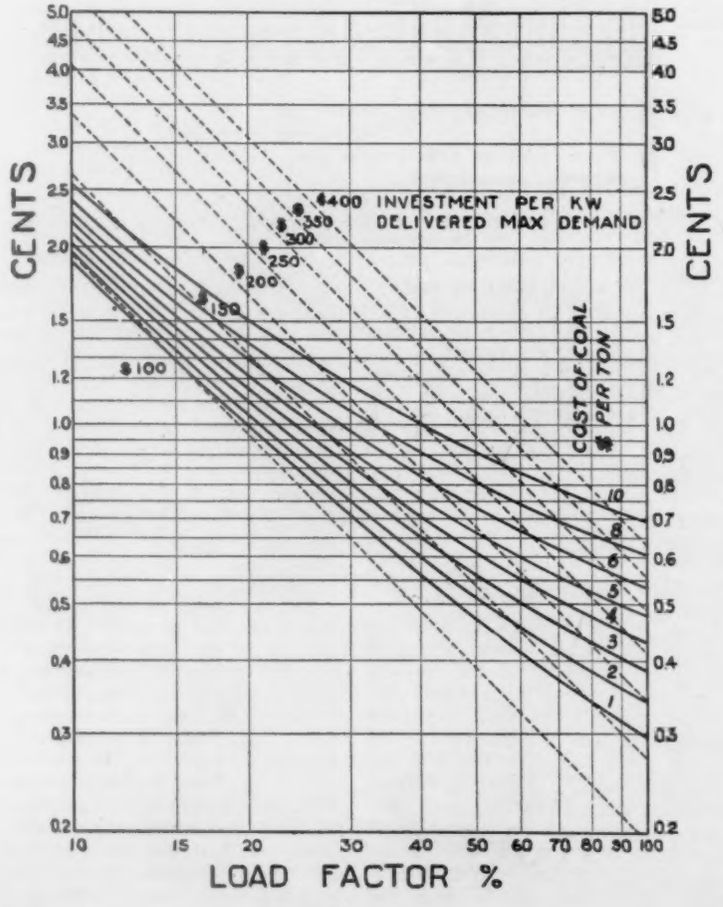
GEO. A. ORROK

Orrok, Myers & Shoudy, Consulting Engineers, New York, N. Y.

THE development and use of mechanical power in the United States has been most phenomenal, even spectacular, while the influence of this development on our civilization has been wide and far reaching.

"I have been asked to treat one part of this large question and shall confine this paper to the 'Economics of Water Power vs. Steam Power,' which perhaps is as controversial as any of the many questions involved in the development and use of power, and here the misconceptions and fallacies are many and have been used by demagogs, politicians and publicists to confuse the issue which is purely economic and not a matter of opinion.

"Fixed charges on cost make up a large portion of the total cost of hydro-electric energy; the operating cost being small. These operating costs average about $2.60 per kilowatt per year while the transmission operating costs run about $2.00 per kilowatt per year. Fixed charges are variously reckoned from 9 to 15 per cent say 6 per cent interest, 4 per cent depreciation, 4 per cent taxes, 1 per cent insurance but for my calculations I use 12.5 per cent as a fair average. The kilowatt hour charge will then depend



on the flow of the stream and how carefully the flow, poundage, and storage can be adjusted to the demand.

"When these costs are known as well as the load factor under which the power is to be marketed, it is easy to construct a diagram which will show the unit cost of hydro-electric power.

"In the central station field many of the newer and better plants are producing electricity at about 1 pound of coal per kilowatt hour while the best plants use only 12,500 B.t.u.'s about 0.9 pounds of coal per kilowatt hour. We may confidently expect thermal efficiencies as low as 11,000 B.t.u's. per kilowatt hour in the near future on a base load plant with a high load factor. Commercial efficiencies depend on cheap fuel, low construction cost and good load factor and the total cost, fixed and operating, in many steam plants is as low as 5 mills, while the best reported cost is below 3 mills per kilowatt hour.

"The costs of steam stations in this country have varied quite widely. Records from more than 100 stations built in this country average about $100 per kilowatt. When taken by 10-year periods, the averages are practically $100 per kilowatt, although during the last 40 years stations have been built as cheap as $50 per kilowatt and some stations have been reported to cost over $200 a kilowatt. Modern stations, within the last few years, have been running from about $115 to as low as $70 a kilowatt, but for purposes of comparison we may take the average cost as $100 per kilowatt. I am figuring, in this comparison, the fixed charges at 12.5 per cent as with the hydraulic plants but I am considering a 20 per cent reserve which is not included in the hydraulic diagram. The steam power cost with different coal prices (solid lines) is clearly lower than hydro-power costs except at very high load factor."

The Legal Side of Our Industry

Leo T. Parker discusses

- **Waste of Natural Gas**
- **Liability for Libel**
- **Injured Employee and Company Negligence**
- **Signing of Statement by Injured Employee**
- **Employee Compensation for Injury**
- **Liability of Carrier**
- **Contracts Made by Manager**

Waste of Natural Gas Prohibited

GENERALLY speaking, any state law or city ordinance intended to conserve natural resources is valid and enforceable if the same is reasonable and not unduly oppressive. An example of this law is found in the late case of People V. Associated Oil Co., 294 Pac. 717.

In this case it was disclosed that the state of California enacted a statute which provided that any unreasonable waste of natural gas "is hereby declared to be opposed to the public interest and is hereby prohibited and declared to be unlawful. The blowing, release or escape of natural gas into the air shall be prima facie evidence of unreasonable waste."

It was shown that certain oil and gas companies, during a single year, had permitted 77,000,000,000 cubic feet of natural gas to escape into the air. Suit was filed to prevent this waste of gas. The companies contended that the state was not lawfully entitled to restrict use or waste of natural gas first, because the law is unconstitutional since it amounts to a taking of property without compensation; secondly, that the provision of the law declaring unlawful the "unreasonable waste" of natural gas is so vague, uncertain and indefinite as to be devoid of any guide or standard as to what shall constitute reasonable or unreasonable waste of natural gas; and, thirdly, that the law is arbitrary and violative of the due process and equal rights guarantees of the state and federal Constitutions.

Notwithstanding these contentions the higher Court held the law valid and enforceable, and said:

"The margin between no waste at all and a reasonable waste in recognition of the propulsive function of the gas is largely one of fact. In the ascertainment of the fact the Legislature has vested in the superior Court full power and duty in the premises. . . . The state could lawfully exercise the power to prevent the waste of the products in which all the surface owners within the area wherein the gas and oil were deposited, as well as the public, had an interest, because in the preservation of these substances the well being and prosperity of the entire community was largely involved."

Gas Company Not Liable for Libel

Any person or firm is liable in damages for libel or slander which is accomplished by any employee or official who acts within the scope of his employment. However, it is important to know that statements which refer to *intended* acts of a gas company, accused of libel or slander, usually do not result in liability particularly if the same are based upon facts.

For example, in Rio Grande Valley Gas Co. *v.* Caskey, 33 S. W. (2d) 848, it was disclosed that a gas company learned that a man named Carver intended to purchase certain property. The company wrote Carver the following letter:

"Dear Sir: We are informed that you have bought or contracted to buy the property here of R. U. Caskey, Lot 9, Block 146. It may be of interest to you to know that we have a mortgage on the water heater in this house and that he still owes us for the gas service line to this house, the total due on both is $50.99, and unless this is paid in the next few days we will repossess the water heater and we will not serve gas to anyone through this line. You will probably have trouble renting the house without gas and I have written Mr. Caskey advising him that we will start proceedings to recover the heater and also file complaint against him for disposing of mortgaged property. You understand the property is liable for the debt of the line."

Caskey sued the gas company for damages, but the higher Court held the company not liable, saying:

"A charge of libel is one accusing an act criminal in its nature. . . . This case offers a good example of erroneous conclusions drawn from the writing of the defendant, for the letter does not charge appellee with having disposed of mortgaged property, but merely stated that he had written appellee that they would 'file complaint against him for disposing of mortgaged property.'"

When Injured Employe Must Prove Negligence of Gas Company

Various Courts have held that unless the evidence clearly indicates that a gas explosion was caused by negligence of gas company employees, a person who is injured as a result of the explosion is not entitled to recover damages.

For illustration, in Hernandez *v.* Southern California Gas Co., 296 Pac. 665, it was shown that for some months prior to the happening of an accident the county sanitation district had been engaged in laying a sewer. The sewer trench was dug, and at the same time the water was pumped out; the pipe was so laid that the bottom of it was about ten feet below the surface of the ground. One afternoon an employe took a coal oil lantern, tools, and materials, and entered the sewer to caulk the joints. He had worked about two hours and was inside of the sewer at a point approximately one hundred and fifty feet from the manhole he entered when an explosion occurred and he was seriously burned.

He sued the gas company for damages and introduced some evidence tending to show that the gas company was negligent. The lower Court held the gas company liable, but in view of the fact that the employe failed to prove conclusively that a leak in the gas company's line had led to the sewer and caused the explosion, the higher Court reversed this verdict, and said:

"The plaintiff (employe) was bound to introduce some evidence, direct or indirect, showing, not only that defendant's (gas company's) gas was allowed to escape, but also that it entered and accumulated in the sewer pipe. . . . Assuming that the defendant was negligent in having some leaks in its pipes, no evidence was introduced showing that any of those

leaks led to the sewer. . . . Evidence was introduced by the defendant showing that it had a large corps of inspectors and repairers who diligently examined."

Effect of Statement Signed by Injured Employe

Generally speaking, a statement signed by an injured employe is admissible as evidence during a trial for damages against a gas company. However, it is for a jury to decide whether the employe signed the statement without knowing its contents, or by fraudulent inducement.

For instance, in Public Utilities Corporation *v.* Carden, 32 S. W. (2) 1058, it was shown that a gas company employed workmen to dig ditches or trenches in which a gas line pipe was to be laid. There was a large rock in the ditch, which an employe was ordered by his foreman to remove. The employe called a fellow servant to assist him and the two began to lift the rock from the ground and just as they did so the fellow employe suddenly released his hold on the rock, causing severe injuries to the other workman who sued the gas company for damages. During the trial the gas company introduced a statement signed by the employe which purported to detail the circumstances of his injury, and it was therein stated as a fact that the fellow employe did not release his hold on the rock. The injured employe admitted signing the statement, but testified that he did not read it when he signed the same.

The lower Court held the gas company not liable, but the higher Court reversed this verdict, saying:

"The signed statement purported to be a detailed narration of the circumstances of appellee's injury, made by appellee himself, and was therefore admissible as substantive testimony. . . . Appellee's testimony as to the circumstances under which it was signed was such, if believed, as to discredit the statement altogether and cause it to be disregarded by the jury; but this too was a jury question."

Employe Not Entitled to Compensation for Injury Sustained While Going to Work

In Nagy *v.* Kangesser, 168 N. E. 517, it was disclosed that a motor truck driver was injured at 7:30 A. M. while driving the truck. The employee was not required to report for duty before 8:00 A. M. but his counsel argued that the company which employed him was liable because he had in his possession the latter's truck when the injury was sustained. However, the Court held the company not liable and explained the established law in the following language:

"Inasmuch as the accident happened prior to 8 A. M., there could be no liability under the doctrine of master and servant, because the employe was not an employe in the performance of any duty in behalf of the master, unless it can be said that the employe is on his master's business while he is en route to his work to perform his duties. This position obviously is not tenable under the authorities, because the master cannot be held liable unless the act in question is part of an actual duty connected with employment. . . . To hold the master liable because of possession of the automobile prior to 8 A. M. would not be based on merit or logic, because such a deduction and conclusion would hold the master liable under any other similar circumstances were any injurious act of the employe at any time between 5 P. M. and 8 A. M. of the succeeding day."

When Carrier is Liable for Failure to Deliver Shipped Merchandise

Usually, a common carrier is liable for *actual* damages to a gas company resulting from its failure to deliver shipped merchandise. However, neither the consignor nor the consignee can recover as damages the profits he *anticipates* that he would have earned on resale of the goods. He must show actual loss of profits.

For example, in Yazoo & M. V. R. Co. *v.* Clarksdale Co., 125 So. 725, it was disclosed that a carrier negligently failed to deliver goods to a consignee who sued the carrier to recover damages. He attempted to prove damages based upon the amount he *anticipated* he lost as a result of the carrier's negligence. The lower Court held the carrier liable for this amount, but the higher Court reversed the verdict, stating the following important law:

"The true measure of damages for the breach of a contract to transport personal property at a certain place and time is the *fair average market value* at the time and place of delivery of such a quantity of like property as the carrier failed to deliver as agreed. It is the amount it would have been necessary for the shipper or owner to pay in the open market at the time and place of delivery for such a quantity and kind of property as the carrier failed to deliver as it agreed."

Who Is Liable for Loss of Goods In Transit?

Frequently litigation results between consignors and consignees regarding the liability for loss of goods in transit. Generally speaking, the one who has legal title to the merchandise during its transportation is responsible and must look to the carrier for payment. Usually, the party who possesses the bill of lading is legal owner of the goods.

For illustration, in U. Koen & Co. *v.* New, 125 So. 764, it was disclosed that a consignee ordered a consignor to ship goods which were lost in transit. The consignee contended that he did not have legal title and, therefore, refused to acknowledge liability. Suit was instituted against the consignee but it was shown that he had not received the bill of lading. Therefore, the Court held that by the act of retaining possession of the bill of lading the consignor or shipper had legal title to the goods which relieved the consignee from liability for loss of the goods. This Court said:

"The right of plaintiff (seller) to recover is, we think, dependent upon whether or not the title or ownership of the property passed to the buyer when it was delivered to the carrier by the manufacturer. . . . Plaintiff (consignor) carried the burden of proof to show that the title or ownership of the proverty passed to defendant when it was delivered to the carrier, and, in the absence of evidence establishing that such was the agreement of the parties, or that the bill of lading directed that the shipment be delivered to the buyer, it cannot be presumed that the title or ownership of the property passed to defendant (consignee) on delivery to the carrier."

When Corporation is Liable for Contracts Made by Manager

Considerable discussion has arisen from time to time whether or not a gas corporation is liable for contracts made for the corporation without authority of the board of directors. Generally speaking, a gas corporation is liable for all contracts made by the manager of a department, or branch of the corporation, so long as such contracts are within the scope of his authority. Moreover, a contract is valid and binding on the corporation, although the manager is not specially authorized to make the contract, providing it is within his general authority and relates to the conduction of the corporation's business.

For instance, in the late case of Municipal Gas Co. *v.* Zachry, 294 Pac. 114, it was disclosed that a local manager of the branch of a gas company entered into a contract by the terms of which he employed an attorney to represent the gas company in legal matters. The manager, named Egolf, agreed that the corporation would pay the attorney $1,250 for the services to be rendered. Later, the corporation refused to pay the bill presented by the attorney on the grounds that Egolf had exceeded his authority in entering into the contract without having approval of the board of directors of the corporation.

The gas company contended that Egolf was merely a messenger and had no authority to make employment contracts.

The attorney contended that Egolf was a local manager and in charge of the affairs of the company and, as such local manager, had authority to employ him.

It is interesting to observe that the lower Court held the gas company liable for services rendered by the attorney, and the higher Court upheld this decision, stating the following important law:

"The president and general manager or general manager of a corporation has the implied authority to employ counsel to represent it in litigation, instituted for or against the corporation or in an advisory capacity, without special action of the board of directors authorizing it. . . . In a law case, where there is competent evidence supporting the verdict of the jury, the same will not be disturbed on appeal on the ground that the evidence was insufficient. The finding of the jury is binding on this Court."

'Therm' Metering of Gas Forbidden

The measurement of gas by use of the therm basis is prohibited by an order recently adopted by the Public Service Commission of Indiana.

The Commission concedes that the therm basis is scientifically correct, but criticizes the methods it says have been used by public utilities in requiring its use and discontinuing the more easily understood cubic foot measurement.

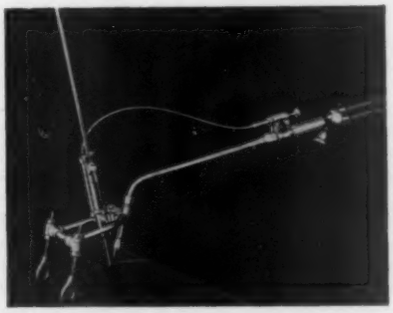
The order followed an investigation initiated by the Commission after the receipt of protests from 32 counties where the new system was being introduced.

The Committee on Public Utility Rates of the National Association of Railroad and Utilities Commissioners recommended the adoption of the therm system by State commissions in its report to the recent convention of the association. The representative of the New York Public Service Commission, however, in a minority report opposed the use of this basis of measuring gas.

EQUIPMENT NEWS

The Lindewelder

A new oxy-acetylene welding blowpipe, revolutionary in design and accomplishment, designated as the Oxweld Type W-21 Lindewelder (Patented), has been introduced by The Linde Air Products Company, 30 East 42nd Street, New York, N. Y. The Lindewelder, together with the new Oxweld No. 24 Patented Lindeweld Process Welding Rod, essential to the achievement of



best results, are for use in welding by the Lindeweld Process.

Through the use of the Lindewelder, the Lindeweld Process becomes almost automatic. Welds are produced at greatly increased speed. In the field of overland pipe line construction, the time required to make a weld has been reduced 40 to 60 percent.

The Lindewelder is a two-flame blowpipe with a rod holder which feeds the welding rod automatically by gravity. A rod-lifting device controlled by a trigger on the blowpipe handle permits the operator to raise or lower the welding rod as required in starting and completing the weld, in passing over tack-welds and in changing rod. A carriage having two adjustable runners supports the blowpipe during the welding operation. This feature provides greater ease in manipulation and complete comfort for the operator, as only one hand is required to hold the blowpipe.

Two separate flames are utilized, one for preheating the welding rod and one for performing the actual welding operation. The upper or preheating flame is so adjusted that the inner cone impinges directly on the rod as it emerges from the lower end of the rod holder, preheating it nearly to the melting point. The lower flame is the welding flame, which is directed between the vee and the rod so that it prepares the base metal for proper fusion with the weld metal and simultaneously melts the end of the preheated welding rod in the welding puddle.

Five sizes of welding tips, Nos. 9 to 13, inclusive, and five sizes of preheating tips, Nos. 4 to 8, inclusive, are available for the Type W-21 Lindewelder. Interchangeable welding rod holders are furnished in three sizes, for ¼ in., 5/16 in., and ⅜ in. welding rod. The change from one size rod holder to another can be made quickly and easily.

Oxweld No. 24 Patented Lindeweld Process Welding Rod, a high strength welding rod with suitable metallurgical characteristics developed specially for the Lindeweld Process, must be used with the Lindewelder in order to obtain best results. It is available in three sizes, ¼ in., 5/16 in., and ⅜ in., which fit the corresponding rod holders.

In operating position, the Lindewelder is supported by the carriage with the runners straddling the weld directly behind the welding puddle. The runners can be adjusted in length and angle, making it possible to maintain the proper position for all types of work. The position of the rod is such that it shields the flame from blowing backwards onto the molten puddle, thus permitting the weld to solidify rapidly, giving greater speed and uniformly producing a typical machine-made joint of proper dimension and shape.

New Emco Meter

The Pittsburgh Equitable Meter Company, Pittsburgh, Penna., recently an-

nounced another new addition to its line of EMCO gas meters. It is known as the EMCO No. 4½ Pressed Steel Gas Meter.

The EMCO No. 4½ is patterned after the EMCO No. 5 pressed steel larger capacity meter, which has operated successfully as an industrial or town border meter. The entire case is of pressed steel with pressed steel frame welded together, thus obtaining extreme rigidity with a minimum of weight, which eliminates fire hazard and damage from external sources.

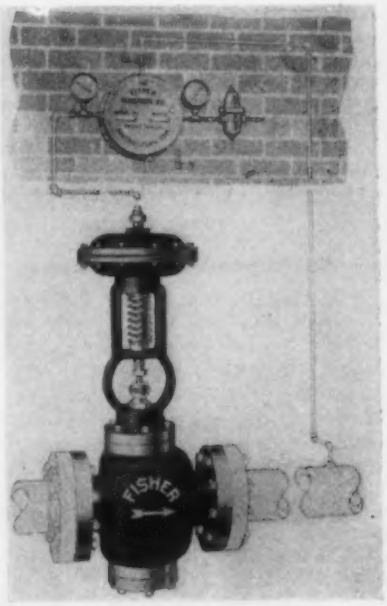
Another feature is its compactness. 45% less space is required than for tin meters of equivalent capacity. Several of these meters can be placed side by side in the floor space formerly required by one meter of smaller capacity.

Bulletin 1018 which contains complete information will be mailed on request.

New Fisher Pressure Controllers

Fisher Governor Company, Marshalltown, Iowa, recently issued Bulletin No. 70 which features "Series 4000 Auxiliary Actuated Pressure Controllers."

The Series 4000 is an exceptionally sensitive pressure controller of the pilot



Complete Series 4000 assembly consisting of control unit with auxiliary regulator and main valve with standard body construction. Installation arranged for reduced pressure control

actuated and auxiliary operated type. It gives accurate and positive control of reduced pressures, relief pressures, or vacua. It is also admirably suited for service as a boiler gas governor, and in this capacity it will function successfully with the highest of boiler pressures.

This controller is used for pressure reducing service where it is necessary to hold the reduced pressure within extremely close limits and still have a widely varying load demand on the low pressure service. When used as a relief valve, this pressure controller is remarkably accurate, and will give close control of the relief pressure.

This controller develops ample power to operate the main valve, and when supplied with the recommended construction for such service it will handle viscous or corrosive fluids. Application of the auxiliary operating medium to secure the movement of the main valve is controlled by a smooth acting control unit, which makes use of the Bourdon Tube principle which has been successfully used in other applications for many years. A copy of bulletin will be mailed on request.

Rex Snap-Action Thermostat

The Cleveland Heater Co., Cleveland, Ohio, recently issued Bulletin No. 16, describing the Rex Snap-Action Thermostat.

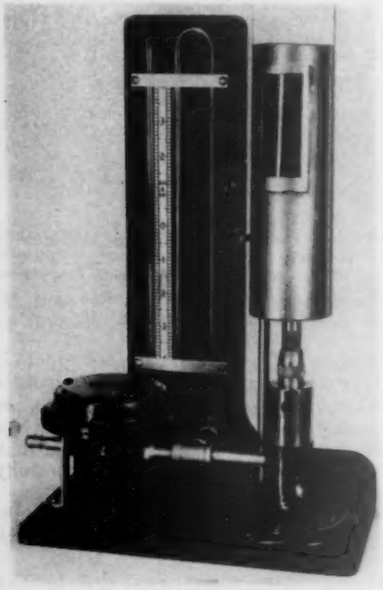
It operates on the principles of the natural law of expansion and contraction. The operation is automatic and simple. The expanding element is a cylindrical bellows, filled with a heat-sensitive gas and hermetically sealed. As the water becomes hot, the bellows expands and pushes forward the finger mechanism, which slides over the knife-edged roll of the gas valve, pulling the valve towards it and closing the valve.

In addition, the design of this mechanism permits settings and adjustments to be made very minutely. The operating range is seven degrees plus or minus of the thermostat setting. It is, therefore, not necessary to chill the thermostat with cold water to make it work.

Rex Snap-Action Thermostats are made for various uses; they can be had with temperature setting as low as 100° F. and as high as 300° F., and any temperature within this range. They can be used in connection with any liquid heating process requiring accurate temperature, when gas is the fuel used for heating. They are also used as limit controls on Hot Water House Heating Systems.

An Improved Calorimeter

The Connelly Iron Sponge & Governor Company, Elizabeth, N. J. recently issued Bulletin No. 7-A describing the "Caloroptic" direct reading calorimeter. The illustration shows the new instrument which permits direct reading for the quick determination of the heat value of gas B.T.U.'s without the calculations for corrections, for barometer, pressure, etc.



It is a modified form of Bunsen burner, the indication for reading being the point of exact elimination of the yellowish, or illuminating, tip of the inner cone of the Bunsen flame; the point of *complete* combustion of the gas.

The Connelly Company have improved the calorimeter by the addition of a metal Shield with a black finish inside and the popular "crackle" black outside. Has a mica window removable placed in slide mounting. Shield can be adjusted to best position on Caloroptic tube according to flame height. A small Governor and U Gauge insures that the gas is maintained at the exact pressure to which the calorimeter is calibrated.

The shield steadies the flame, sharpens reading but does not interfere with the scale visibility. It can be used for manufactured or natural gas, butane and mixed gas. Copy of bulletin will be mailed on request.

Martin-Decker Utility Model Pulsation Dampener

The dampening out of pulsations in compressor and pump lines so that reliable gauge and recorder readings can be obtained has always been a difficult problem to solve satisfactorily. Each condition of pressure, operating fluid and degree of pulsation required a different dampening effect, and often a different type of dampening unit.

After several years of experimentation and testing, the Martin-Decker Corporation, Long Beach, Calif., has produced the adjustable dampening unit illustrated herewith. It is known as the "Utility Model Pulsation Dampener" and is adapted for throttling the pulsations of gauges and recorders on compressors, pumps and pressure operated devices of all types. Due to its adjustable feature this device may be used either for a few inches of water or for several thousand pounds gauge pressure in liquids or gases. While dampening out all pulsations, whether slow or rapid, there is no appreciable time lag. It is immediately sensitive to either large or small changes in pressure and the gauge always indicates the true mean pressure. It is easily cleaned, if ever necessary, without disturbing the connections. It is not a needle valve, nor does it operate on the needle valve principle.

Gauges and recorders protected with this device will last as long as if on constant pressure lines, besides giving an accurate readable indication and record. It is equally adaptable to low pressure manometers, U-tubes, and draft gauges, orifice meters and many other types of pressure instruments.

It is manufactured in two models; the "Regular" with brass body and stainless steel stem for usual installations; and the "All Stainless" for use under high temperatures, extremely high pressures and other installations where brass would not be adaptable.

Additional information will be furnished by the manufacturer upon request.

New Orifice Disc Housing

Pacific Pipe & Supply Co., at Los Angeles announces the placing on the market of the Papico Orifice Disc Housing. The fitting is a simple plate container provided with a unique locking device for holding the disc. This housing is used where the meter installation includes a by-pass. The advantages claimed are that orifice discs may be easily and rapidly changed without having to loosen and take out the many bolts of a pair of flanges and then spread them apart either with jack screws or wedges. This feature is of particular value where the line size is large or where the meter run is placed close to a wall or on the ground.

It is not necessary to carry a new style of disc on hand as the Papico Housing uses the Robinson type plate.

A complete description may be had on request to the Pacific Pipe & Supply Company.

New Brown Flow Meter Catalog

Flow Meter Catalog No. 2002 has just been issued by The Brown Instrument Company, Philadelphia, Pa. This bulletin features the latest developments in this line of electric flow meters operating on the inductance bridge principle. One of these new developments, the low range manometer for measuring flow of gases, is described as well as the Brown high pressure flowmeter manometer, designed for measuring the flow of liquids, vapors or gases that are under pressures up to 5,000 pounds per square inch.

Copies of this catalog can be obtained upon request.

Bristol Issues Two New Catalogs

The Bristol Company, Waterbury, Conn. have just issued two new catalogs. No. 2025 describes and illustrates Bristol's Thermometer Controllers and No. 2050 covers Bristol's Pyrometer Controllers.

These catalogs give details of construction of the various models and their operation. The many uses for these instruments are also given. Price list is included with each catalog.

NEWS *of the* GAS INDUSTRY

Natural Gas Now Being Piped Into Minnesota

Natural gas is now being piped into the State of Minnesota by the Northern Natural Gas System, the gas coming from all of the major gas pools in Texas, Oklahoma, Kansas and Wyoming. The line is now just south of Owatonna and is a 16" welded pipe line on an air line from Mason City, in the direction of Minneapolis and St. Paul.

The first city or town in Minnesota to actually receive and use natural gas will probably be Wells, a town of approximately 1800 people, which town has granted a franchise to the Peoples Natural Gas Co., a subsidiary of the Northern Natural Gas System Pipe Line and the contract for building the mains in the City of Wells has been let to The American Gas Construction Co., C. I. Tenney, president. It is expected that natural gas will be turned into the mains at Wells before January 1.

Hattiesburg Connected with Jackson Gas Field

The connection of the Jackson gas field with Hattiesburg marks an epoch in the industrial life of Mississippi. Frank K. McGehee, president of the Public Service Corporation of Mississippi installed a pipe line from Hattiesburg to Jackson, through Seminary, Collins, Mount Olive, Magee, D'Lo, and other points to Jackson. The turning on of the gas at Jackson was celebrated recently with Mayor Scott of Jackson and Mayor Tatum of Hattiesburg and other distinguished Mississippians participating. A like celebration was held later at Kamper Park in Hattiesburg where Mayor Scott of Jackson and Mayor Tatum of Hattiesburg and notable citizens not only in Hattiesburg but the surrounding country were enthusiastic participants.

The Public Service Corporation of Mississippi has a franchise to furnish Hattiesburg with gas for twenty-five years and has like franchises for towns between Jackson and Hattiesburg, at rates low enough to induce industries to locate at the various points. The gas for the Hattiesburg franchise and other franchise towns is being furnished by the Southern Petroleum Company of Jackson, of which W. E. Willis is president. This company owns three wells just east of Pearl River in Rankin County, and is now engaged in the drilling of additional wells in Hinds County, one of them near the north corporate limits of Jackson. This well is known as the Edgar S. Wilson No. 1, which is to be connected up with the Hattiesburg pipe line.

It is estimated that the three wells of the Southern Petroleum Company, and the one that they feel confident of bringing in immediately, will furnish about 200,000,000 cubic feet of gas per day which will guarantee many times the gas necessary for Hattiesburg and the intermediate towns, with a surplus for local manufacturing plants. There are now fifty-two gas wells in the Jackson area, the gas from some of which is being used already.

New Gas Company Headquarters in Seattle

Expanding rapidly in Seattle, Wash., the Seattle Gas Company has now secured new and enlarged quarters to care for future expansion in 1932 and thereafter. The building acquired will be renamed the Gasco Building.

Plans of the gas company in the Northwest metropolis include the creation in the new home of a home-service auditorium that will be useful for the company in conducting cooking schools.

The gas company will occupy in addition to the ground floor, the basement and two upper floors, which will comprise 25,964 square feet, or double its present floor space.

Granted Franchises

Detroit Lakes Gas Company has been recently granted five additional franchises in the following Minnesota towns, Bertha, Hewitt, Henning, Battle Lake and Twin Valley.

This makes a total of twenty-four towns now being served with undiluted propane gas service by the Detroit Lakes Gas Company in the territory immediately adjacent to Detroit Lakes, Minnesota.

Important Ruling in Pipe Line Case

Mississippi's attempt to compel the Interstate Natural Gas Company to pay a privilege tax on a pipe line in the state was dismissed November 22 by the U. S. Supreme Court.

The court upheld the ruling of the lower courts that the pipe line was exempt from the tax because it was engaged in interstate commerce.

Dave C. Bramlett, counsel for the Interstate Natural Gas Company, Incorporated, of New York, argued the "pipe line case," involving the constitutionality of the law before the supreme court of the United States in Washington on Monday, October 26.

The federal court in New Orleans, composed of Circuit Judge Rufus E. Foster and District Judge Edwin R. Holmes and Judge Wayne G. Borah, granted a final decree in February last making perpetual an interlocutory injunction enjoining the enforcement of the pipe line section of the Mississippi Privilege Tax law, as violative of the commerce clause of the constitution of the United States.

In view of the enormous investments made in pipe lines throughout the United States in recent years and billions of feet of natural gas transported and sold, widespread interest had been manifested in the case.

Convention Calendar

February

3-4 New England Gas Association convention, Hotel Statler, Boston, Mass.

April

28-30 Missouri Association of Public Utilities, Excelsior Springs, Mo. F. D. Beardslee, secretary.

June

9-10 Canadian Gas Association Winnipeg, Manitoba, Fort Gary Hotel. G. W. Allen Secretary.

October

10-14 American Gas Association, Atlantic City, N. J.

To Build Gas Systems

The Kansas Pipe Line & Gas Company will build the distribution systems and serve the towns of Macksville, Belpre, Seward, Claflin, Bushton, Holyrood, Beverly, Tescott, Delphos and Miltonvale from the new 26-inch line now being built by The Missouri Valley Pipe Line Company between Mullinsville and Clifton. Franchises are being secured and preliminary surveys have been made in each town.

Latest Additions to Columbus Group

The comforts of natural gas will be enjoyed this winter by residents of Greenwich, Holmesville, Fredericksburg, The Plains and Donaldsville, Ohio. These are new additions to Columbus Group, distributing plants having just been installed.

Gas Conservation Act of California Upheld

The validity of the California Gas Conservation Act was upheld by the Supreme Court of the United States on Nov. 23, in an unanimous opinion written by Mr. Chief Justice Hughes.

The statute declares the unreasonable waste of natural gas to be opposed to the public interest. It prohibits unreasonable waste of gas and declares that "the blowing, releasing or escaping of natural gas into the air shall be prima facie evidence of unreasonable waste."

The law was enacted, according to counsel for the State, to prevent the waste "of an energy producing substance which can not be replaced in a commonwealth entirely without coal." It was shown, it was stated, that during the year 1928 over 77,000,000,000 cubic feet of natural gas were wasted into the air from the subsurface oil and gas zones in the State of California derived from the operation of oil wells. The natural gas so wasted, the court was told, was the energy equivalent of 3,850,000 tons of coal. The increasing demand for natural gas in domestic use was said to require that the supply be conserved.

The oil companies complained in the case of an order curtailing their gas production approximately 50 per cent, with a consequent reduction in the production of oil of the same amount. The sole ground for this curtailment, it was argued, was for the purpose of conserving the natural gas for the benefit of the general public. The enforcement of the order, according to attorneys for the oil companies, requires the shutting down of producing wells, the average cost of each of which is $150,000. This is said to result in a decrease in income and loss of oil to the companies of approximately $12,500 per day, and a loss of $3,000 per day in casing-head gasoline.

Two cases are now pending on the courts' docket involving the validity of an Oklahoma statute relating directly to the regulation of the production of oil. These cases concern the power of the State to adopt the so-called proration method of restricting the output of oil from wells within the State.

New Link in High Pressure Gas Line Completed

For the first time in 33 years, gas making operations at the Gloversville-Johnstown gas plant of New York Power and Light Corporation have ceased. The new supply for these two cities is now manufactured in Troy, nearly 50 miles distant, at the coke oven plant of Hudson Valley Fuel Corporation and delivered through high pressure mains, by way of Schenectady and Amsterdam. The local plant will be maintained in operating condition to serve as a standby unit.

The new link in this high pressure gas main was recently completed from Amsterdam to Gloversville. About 125 men have been working during the past three months on the project. With this new line in service, the centralization of gas manufacture at the Troy coke oven plant is nearly completed. Only the gas sold in Hudson and Canajoharie, out of 20 cities and villages served with gas in the territory of New York Power and Light Corporation, is now manufactured in local plants.

The network of high pressure mains extending from Troy now reaches Albany, Rensselaer, Cohoes, Watervliet, Schenectady, Ballston, Saratoga, Glens Falls, Amsterdam and now the Johnstown-Gloversville area, besides numerous villages between these cities.

With all this modernization and improvement of facilities, historians have been prompted to delve into the history of gas in this area. Only a few of the older residents will be able to recall the days, in 1856 and 1857, when Gloversville and Johnstown were introduced to the "new-fangled" gas illumination.

The use of gas in Gloversville antedated Johnstown by a year, for in 1856 Stewart Mills, a hotel owner in Gloversville, built a small resin gas plant primarily to supply illumination to the old Windsor Hotel, later extending this service to the neighboorhood churches and a few private homes as an accommodation. This small, crude plant had a storage holder of 4000-cubic foot capacity and never grew to any larger size because of the high cost to the consumer, for gas was then $10.00 per thousand cubic feet. Three years later the Fox and Demarest Company was organized, purchasing this plant from Mr. Mills and going into the business on a little larger scale.

The new company, to meet the increasing demands for gas, soon built a small coal gas plant, increasing the storage capacity nearly four times and extending the mains to a total of about five miles. The Civil War forced this company to close its resin plant and from that time until 1888 the coal gas plant served the village of Gloversville.

The Johnstown Gas Company was formed in the year following the installation made by Mr. Mills in Gloversville. Some years later these companies combined and were known at that time as the Johnstown-Gloversville Gas Company.

Open New Office

The Illinois Power and Light Corporation recently opened a new office and display room in Edwardsville, Ill.

Pacific Coast Gas Appliance Manufacturers Hold Meeting

For the purpose of further acquainting manufacturers of gas appliances and equipment with the recently-organized group activities within the Manufacturers' Section of the American Gas Association, a meeting was held December 1, at Los Angeles, Calif. A similar gathering of appliance manufacturers is to be held in San Francisco.

Philip O. Deitsch, manager of group activities of the Manufacturers' Section, was designated to attend the coast meetings in order to outline details of this new work. According to Mr. Deitsch, manufacturers on the Pacific Coast have manifested unusual interest in the movement and have requested the Association to give them first-hand information in this connection.

Among the activities which have been undertaken is consideration of the inauguration of standards of practice, whereby each branch of the industry will codify and establish for itself certain standards of ethical business conduct.

Another activity in which the groups are interested is the cross-licensing of patents, which has in view the elimination of litigation within the gas appliance manufacturing industry. Under the plan contemplated use of patents held by manufacturers would be made by the holder to another for royalties to be stipulated by an evaluation committee, which also would serve, should disputes arise, as an arbitration committee.

At the annual meeting of the Manufacturers' Section, held in Detroit, last September, the largest gathering of gas appliance manufacturers ever assembled unanimously ratified the new program.

Gas Companies Denied Increase in Natural Gas Rate

The petition of the Atlanta Gas Light Company, together with three other companies supplying natural gas to sixteen Georgia cities for an increase of approximately 30 per cent in rates, was denied recently by the Georgia Public Service Commission.

The order was issued following a series of hearings which began in May and lasted until the end of September, based largely on the value of the properties of the Atlanta Gas Light Company.

Under the order of the commission, the gas companies are denied their increase in natural gas rates. On the other hand, the commission refused to accept a valuation of less than $10,000,000 for the properties of the Atlanta Gas Light Company, and will not reduce its rates.

Other gas companies effected by the decision are the Macon Gas Company, the Georgia Public Utilities Company, serving Augusta, and the Georgia Natural Gas Corporation, serving College Park, Decatur, East Point, Hapeville, Griffin, Calhoun, Cedertown, Carrolton, Newman, Forsyth and other cities in the state.

Who will be the first to awaken him?

All Oklahoma City Schools to Use Gas Service

The work of Oklahoma Natural as a public servant in Oklahoma City was greatly increased when the Board of Education voted to use the gas service of this company for heating every school building in the city.

This decision, which was reached unanimously by the Board after careful consideration of comparative fuels, will add approximately 100,000,000 cu. ft. a year to the amount of gas supplied by Oklahoma Natural in Oklahoma City.

Thirty-three school buildings, including high schools as well as grade schools, will be connected with the O. N. G. service lines. Four of these are new buildings, the other twenty-nine having used coal for heating in previous winters.

Besides the thirty-three schools for which gas service has just been contracted, there are eleven Oklahoma City schools already equipped for gas heating, and it was largely due to the satisfactory service in these that the decision was made to heat all schools with gas. The dependability, cleanliness, healthfulness and convenience of gas heating, together with the economy brought about by the new low Oklahoma Natural rates, were found especially desirable for Oklahoma City's modern school system.

Househeating Council to Meet

The second annual conference of the Metropolitan Househeating Council will be held on December 16th, 1931, at the Hotel McAlpin, New York, at 9:30 A.M.

A very interesting program has been arranged on subjects relating to gas househeating. An all day session including luncheon has been arranged and gas company representatives who are particularly interested in the sale of gas househeating are cordially invited to attend.

The officers for the current year are: Harry A. Sutton, Public Service Electric & Gas Co., Chairman; Fred T. Head, Consolidated Gas Company, New York, Vice-Chairman; Frank B. Herty, Brooklyn Union Gas Company, Secretary and Treasurer.

The invitation to visiting members of the gas utilities is also extended for the regular monthly meetings which are held on the third Wednesday of each month from September to May, inclusive, at 9:30 A.M. in Room 1835-S of the Consolidated Gas Company Building, Fifteenth Street and Irving Place, New York City.

Montreal Light Heat & Power Report Increased Earnings

Montreal Light Heat & Power Consolidated reports well sustained gross earnings and net income for the first nine months of the year to September 30th.

Electricity and gas revenues both show satisfactory increases under present business conditions with operating expenses down $100,000, reflecting the Company's economic and efficient management; while miscellaneous earnings, which include income from investments, show substantial increases—a manifest advantage to customers and shareholders alike as a factor in the maintenance of low rates and sustained earnings.

Net income, after fixed charges, is up some $590,000 compared with the same period last year and as a result dividends have been earned almost twice.

High Court Must Pass on Decision

Attorneys representing ten subsidiaries of the Cities Service company in Kansas secured a restraining order in the state supreme court, prohibiting state authorities from interfering with the public utility concerns selling appliances within the state.

A law passed by the recent legislature prohibits the selling of appliances by public utilities within the state of Kansas. This law was upheld by the Shawnee county court, and notice of an appeal was served, hence the injunction while it is pending, hopeful that the law will be declared "class legislation" and therefore unconstitutional.

Northern Natural Gas System Adds Ten Towns

Ten additional towns received natural gas from the Northern Natural Lines during October. The Peoples Natural Gas Company, a distributing division of the Northern Natural, added Bancroft, Palmyra, Weeping Water, Wymore, and Blue Springs—all in Nebraska.

The Iowa Gas Distributing Company, another distributing division of Northern Natural, added Lehigh and Ogden in Iowa.

Adams, Nebraska, is being served by the Iowa-Nebraska Light & Power Company; Des Moines by the Des Moines Gas Company, and Lake City by the Iowa Public Service Company.

Gas Equipment at the British Industries Fair

One of the most important displays at the next British Industries Fair to be held at Castle Bromwich, Birmingham, from February 22 to March 4, 1932, will be gas equipment.

The exhibits in this group are a revelation of what can be and is done by the gas services of Great Britain for industry, the home and for public service. The manufacturers of equipment are continually turning out new and improved designs, for upon their ingenuity depends the continuance of the popularity of gas in the face of big developments in other methods of providing heat and light and the result of their efforts is to be seen each year in the Fair.

Gas Company Elect Officers

Stockholders of the Public Service Company of Colorado re-elected all present directors and in turn all officers were re-elected. Henry L. Doherty is president; Clare N. Stannard, vice-president and general manager; John E. Loiseau, secretary; Harry T. Hughes, treasurer.

Awards Natural Gas Franchise

Mancos, Colorado, awarded a franchise to the Northern Pipe Line Company of Minneapolis, Minn., to serve it with natural gas. The gas will be piped from the Hallar field seven miles distant.

Cities Service Earnings Show Slight Increase

For the third successive month Cities Service earnings show a slight increase to be maintained due to the increased consumption of domestic electricity, and the seasonal demand for natural gas.

During September the 208 mile 12-inch pipe line extending from East Texas oil fields to Port Arthur, Texas, was completed. The completion of this line makes an outlet available for production from this area to eastern seaboard refineries. Empire Gas & Fuel Company, a Cities Service subsidiary, owns a substantial interest in this line.

The number of Cities Service Company Common stockholders has increased 59,934 since the 15th of January. Common stockholders increased more than 11,000 since September 15th and now number 498,809.

Regular monthly dividends on Preferred, Preference BB, Preference B and Common stocks were declared, all payable December 1st to stockholders of record November 14th.

Association Seeks New Members

Charles F. Roeser, acting president of the new Texas Oil and Gas Conservation Association, has announced plans for a statewide membership drive designated to affiliate every oil and gas producer in the State with the organization.

The Texas Oil and Gas Conservation Association, which has its headquarters in Fort Worth, was organized through the efforts of five organizations, representatives of every part of Texas. They are the East Texas Home and Land Owners' Association; the San Antonio Independent Producers; North Texas Oil and Gas Association; the Oil Emergency Committee; and the East Texas Steering Committee.

The purpose of the association is to conduct a campaign to encourage the conservation of Texas resources. At the initial meeting held in Dallas recently, when preliminary plans were made, 1,235 memberships were pledged, and since that time scores of others have been received.

Natural Gas Production Increased Four Times; Consumers Six Times

Since 1920 the output of natural gas in the three largest producing states, Texas, Oklahoma and California, has increased approximately four times, while the number of users has multiplied more than six times, according to a bulletin issued by Appalachian Gas Corporation. The production of the three states in 1930 was 1,015,000,000,000 cubic feet against 256,000,000,000 cubic feet in 1920. In Texas, Appalachian Gas Corporation is engaged in all three branches of the natural gas industry, production, transportation and distribution, through its wholly-owned subsidiary, Texas Gas Utilities Company, besides operating through ten other subsidiaries and affiliates in the Appalachian field and the Monroe field of Louisiana.

"Texas, with a greater pipeline mileage than any other state, showed an increase in natural gas distribution for the ten-year period ended 1929, of over 500 per cent," says the bulletin, "the consumer increase being in about the same proportion. In 1920 natural gas distribution was 21,667,407,050 cubic feet, increasing to 103,021,902,000 in 1929. Number of consumers increased from 94,306 in 1920 to 422,014 in 1929. Average Texas price per 1,000 cubic feet of natural gas was 42.3 cents."

Name Resident State Agent

According to papers filed with the secretary of state in Indianapolis, H. A. Sprowls, LaPlante building, Vincennes, Ind., has been named resident state agent for a number of gas companies operating in the southwestern part of the state. The companies naming him their Indiana agent are: Indiana Southwestern Gas Corporation, a New Jersey corporation; Wabash Public Service Corporation, an Indiana company; Wabash Consolidated Utility Corporation, an Indiana company; Pike Gas Company, Inc., an Indiana corporation, and the Newton Pipe Line Company, Inc., an Indiana company.

Gets Natural Gas Permits

The Arkansas Valley Natural Gas Company which was awarded a franchise to serve Manzanola, Ordway and Sugar City, Colorado, with natural gas, were given permission by the public utilities commission to carry out its right.

File Articles of Incorporation

Articles of incorporation have been filed with the Indiana secretary of state by the Elberfeld Gas and Oil, Inc., having a principal place of business at Fort Branch, Ind. The corporation has an initial capital stock of 500 shares having a declared par value of $100 each and is formed to drill for natural gas and oil and distribute the products. The first board of directors is composed of Karl Michel, Engelbert Mitchell and Clemens H. Obert.

Declare Dividend

The Board of Directors of the West Ohio Gas Company has declared the regular quarterly dividend of one and three quarters per cent on the outstanding Preferred Stock of the Company, payable December 1, 1931, to stockholders of record November 14, 1931.

Excellent Publication on Oxy-Acetylene Welding and Cutting

Oxy-Acetylene Welding and Cutting (2nd Edition) *by Stuart Plumley;* 410 pages, 7¾ x 11, 568 illustrations; price $5.00. Stuart Plumley Course of Instruction, 2619-33 Fourth St. S. E., Minneapolis, Minn.

This is perhaps the finest text of its character that has come to our notice. Mr. Plumley, who has had a vast experience with his subject extending over thirty years, has demonstrated in this work a happy faculty of saying much, interestingly and in few words. The text is in the nature of lessons and there is much material which is of the "kink" or "wrinkle" variety. The illustrations have been chosen and executed with a care that places the work far ahead of the average publication of this type.

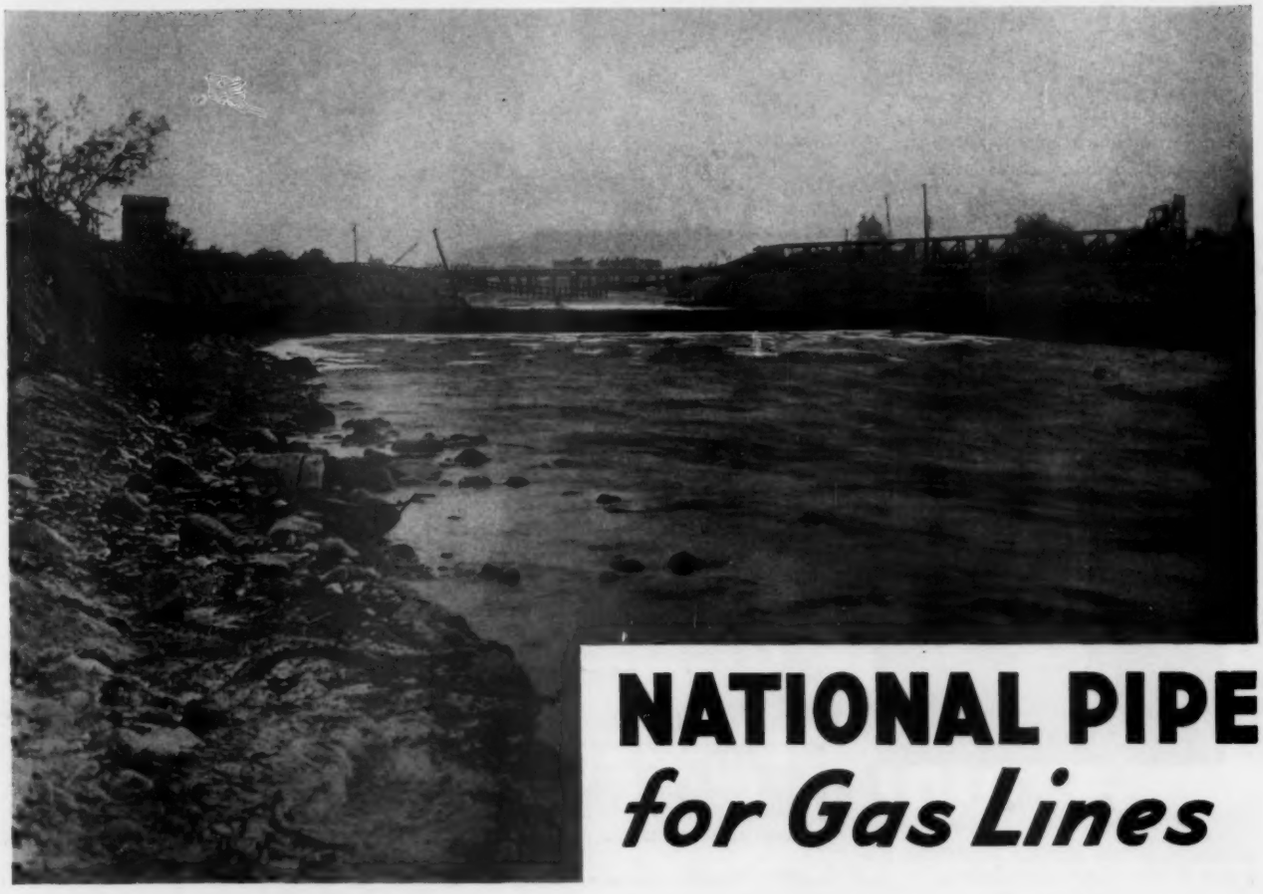
The gas man will find a wealth of information in Mr. Plumley's book that will immediately enable him to better his welding work, whether out on the distribution system, in the plant or at the shop bench. Any gas company that has oxy-acetylene welding equipment can ill afford to be without this very fine effort of the author.

Petroleum, Asphalt and Natural Handbook

The 1931 edition of Handbook, Petroleum, Asphalt and Natural Gas, under the authorship of Roy Cross, has been issued by Kansas City Testing Laboratory, 700 Baltimore Avenue, Kansas City, Missouri. This volume of 864 pages, including more than 200 illustrations, is supplied by the publishers at $7.50 per copy. It is an up-to-date, revised issue of the handbook which is already well known because of the issue of several preceding editions.

ANSWERING THE QUESTION

"is it durable?"



NATIONAL PIPE *for Gas Lines*

A NATIONAL Pipe line across a flood-swollen river became a tubular bridge without intention. Yesterday well buried below the stream, today the line was not only unsupported from shore to shore but exposed to the force of the current and the impact of timbers and other floating objects until the flood subsided. No engineer would recommend imposing such a test on NATIONAL Pipe or any other pipe. But the fact that on occasion it has withstood the most abnormal strains, gives added assurance of the trustworthiness of NATIONAL Pipe for all conditions that are likely to affect it in practically any service. Stamina, among other qualities, proved through many years has made NATIONAL in the gas fields as elsewhere—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

American Bridge Company
American Sheet and Tin Plate Company
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Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. Export Distributors—United States Steel Products Company, 30 Church Street, New York, N. Y.

Personals

R. R. Gilbert, who has been Agent of the Oakland Division of Cumberland & Allegheny Gas Company, has been transferred to Buckhannon, W. Va.

Mr. Gilbert entered the employ of Cumberland & Allegheny Gas Company in 1910.

Succeeding Mr. Gilbert at Oakland is Mr. S. H. Jackson who was formerly located there.

Evan B. Strauss has been placed in charge of Public Relations of the Jersey Central Power & Light Company, Asbury Park, N. J.

Mark Anton, of the Suburban Gas Company, Belleville, N. J., was elected

Mark Anton

president of the recently organized National Bottled Gas Association.

John M. Hendrix has been appointed special West Texas representative for the Community Natural Gas Co., with headquarters in Sweetwater. Mr. Hendrix was formerly secretary-manager of the Sweetwater Board of City Development.

Thomas G. Storey, formerly associated with the Cities Service Company in Denver and Toledo and with the Kansas City Gas Company in Kansas City, has joined the business staff of Oklahoma Natural Gas Corporation, Tulsa, as an advisor on house heating problems.

R. H. Lively was recently appointed local manager of the Kansas Pipe Line & Gas Company at Salina, Kansas.

W. E. Wade has been transferred from Lindsborg to Blue Rapids, Kansas, as local manager of the Kansas Pipe Line & Gas Company.

J. E. Furneaux replaced J. C. Reid as division manager of the Community Natural Gas Company at Handley, Texas. Mr. Reid accepted a position with the Mississippi Valley Gas Company.

Theodore Boettger of Hackensack, N. J., was recently named a director of Public Service Corporation of New Jersey, to fill the vacancy caused by the death of Uzal H. McCarter. The appointment was made at the regular meeting of the board in Newark.

C. B. Reasor has been appointed district manager of the electric and gas properties of the Western Power, Light & Telephone Company in Oklahoma and Texas. Mr. Reasor's headquarters will be in Harper, Kansas.

William A. Hudson has been appointed general sales manager of the Birmingham Gas Company and placed in charge of all gas sales activities such as domestic, commercial, industrial and house heating. He succeeds George H. Schlatter who has gone with a refrigerator concern.

Mr. Hudson has been actively connected with the gas business in Birmingham for several years. He is a graduate of Vanderbilt university. After leaving college he joined the Westinghouse Electric & Manufacturing Co. in Pittsburgh as a student engineer, then returned to Birmingham where he was gas engineer at the by-product plant of the Sloss-Sheffield Steel & Iron Company, which plant supplies coke oven gas for Birmingham.

In 1925 Hudson entered the gas sales department of the Birmingham Electric Company.

When the Birmingham Gas Company was organized and took over the gas business of Birmingham in 1929, Hudson became manager of industrial gas sales, a position he held until his promotion to general sales manager.

C. C. Redding, former manager of the Community Natural Gas Company at Bryan, Texas, has been appointed manager at Abilene. The Community Natural Gas Company recently purchased the gas distribution system at Abilene from the West Texas Utilities Company.

M. E. Adams succeeds C. C. Redding as manager of The Community Natural Gas Company at Bryan, Texas.

H. L. Dyer is manager of the new property of the Community Natural Gas Company at Cisco, Texas.

Hugh McNair, manager of the Gas Utility, Winnipeg Electric Company, Winnipeg, Canada, and also President of the Canadian Gas Association, was recently notified by the Association Technique de L'Industrie Du Gaz En France that he had been elected an honorary member in that group.

Rufus G. Gentry, superintendent of the Public Service Company of Colorado was elected president of the Denver Baptist Union.

Captain A. E. Higgins, flying field representative of the Commercial Section for the past five years, on December 1, became Secretary of the Natural Gas Department of the American Gas Association, succeeding Mr. E. J. Stephany, resigned.

Captain Higgins, who rose to the rank of Major during the World War, and who retired with the rank of Captain to re-enter civil life, March 1, 1926, is a familiar figure throughout the natural gas area, particularly in the Southwest and in California, where he is well-known as the "Flying Gas Captain."

Captain A. E. Higgins

This is due to the fact that he travels exclusively by airplane; he has crossed and re-crossed the Rocky Mountains repeatedly on trips to and from California and various points in the Southwest. In his capacity as field representative, he has travelled all over the United States, assisting member gas companies in sales policies and in the promotion of cooperative merchandising plans.

Captain Higgins owns his own plane, and says that it has assisted him materially in covering thousands of miles of territory in a short time.

Flying to Kansas City from the Pacific Coast, Captain Higgins recently held a conference with Major T. J. Strickler, chairman of the Natural Gas Department, and after discussing various phases of his new work, flew down to Dallas, Texas, where he will make his headquarters.

Mr. Stephany has been secretary of the Natural Gas Department since December 8, 1928, and, except for a short time, maintained his office in Dallas. Mr. Stephany formerly held important positions with the Equitable Gas Company at Pittsburgh.

Alexander Forward, managing director of the American Gas Association, has expressed his appreciation of Mr. Stephany's loyal and capable service.

Frank H. Trembly, Jr., has been appointed Supervisor, Industrial Division of the Philadelphia, Pa., Gas Works Company replacing Mr. Ellwood Griest.

(Personals continued on page 68)

How is this for Load Building?

There are Humphrey Gas Unit Heaters of proper capacity for every purpose—No. 100 (above) with 100,000 hourly B.T.U. input—No. 200 with 200,000 hourly B.T.U. input—and No. 60 with 60,000 hourly B.T.U. input. All operate 83% efficient when vented.

Night and day, the Mack Truck Co. Garage at Salt Lake City, Utah, burns gas in 4 No. 100 Humphrey Gas Unit Heaters and thousands of similar load-building installations have been made by progressive utilities throughout the country.

Night and day, Humphrey Gas Unit Heaters build loads that make gas lines profitable, and bring new standards of heating comfort, convenience, and cleanliness to users.

Garages, Airplane Hangars, Industrial, Commercial Buildings, and similar locations form a market well worth intense cultivation. Write today for extracts from the Underwriters' report of approval and our latest catalog.

A HUMPHREY PRODUCT

General Gas Light Company
Kalamazoo, Michigan

44 West Broadway
New York

135 Bluxome Street
San Francisco

J. H. Braine has been appointed Engineer of Distribution, of The Brooklyn Union Gas Company, according to an announcement made recently, by H. E. McGowan, Secretary. Mr. Braine succeeds J. T. White, who died November 18th.

Mr. Braine, who was assistant Engineer of Distribution prior to his recent appointment, entered the employ of The Brooklyn Union Gas Company on January 1st, 1909, as Superintendent of Holder Distribution. On February 1st, 1927, he was made Assistant Engineer of Distribution.

Mr. Braine started in the gas industry with the Essex and Hudson Gas Co., which afterwards merged with the Public Service Corp. of New Jersey. He remained with the latter concern until 1908 when he left the gas industry for a while before becoming associated with The Brooklyn Union Gas Company.

Ray L. Edwards was recently appointed Safety Director of the San Diego Consolidated Gas & Electric Company, San Diego, California.

S. B. Gamble was recently appointed to the newly created position of Commercial Gas Engineer of the Public Service Company of Northern Illinois, Chicago. Mr. Gamble is a graduate of Georgia Tech. where he studied mechanical engineering. He has had a variety of experience in gas engineering and sales.

Mr. Gamble's duties will include surveys and estimates as well as selling gas for commercial purposes; studying new commercial uses for gas; furnishing assistance and advice to the District Sales Departments and training commercial appliance salesmen.

Clarence S. Reed succeeds Mr. H. W. Hennig as agent of the Public Service Electric & Gas Company at Jersey City, N. J. Mr. Reed was formerly agent at Bayonne.

A. J. Murray, formerly of the Germantown new business office of the Philadelphia, Pa., Gas Works Company was appointed District Representative of the Spring Garden District, succeeding Mr. C. A. Yeich who has resigned.

Obituary

JOHN THOMAS WHITE

John Thomas White, 62, Assistant Secretary and Engineer of Distribution of The Brooklyn Union Gas Company, died November 18th at his home in Brooklyn after an illness of only two days. A septic condition, which appeared at first to be a simple throat infection, was the cause of death.

Mr. White was a native of New York City, born April 30th, 1869. As a boy he entered the employ of The Consolidated Gas Company of New York, and on April 1, 1910, left that company to join The Brooklyn Union Gas Company. His first position with the Brooklyn company was that of Assistant Superintendent of the Street Division. Two years later he was made Superintendent of that division and in 1920 was elevated to the position he held at the time of his death.

The deceased was a member of the American Gas Association, the Hamilton-Crescent Club of Brooklyn, Brooklyn Chamber of Commerce and Queens Chamber of Commerce. He was a vestryman of St. Mark's Episcopal Church, from which church funeral services were held on November 21st.

Mr. White is survived by his widow, Mae A. White.

ARTHUR E. SCOTT

Arthur E. Scott, 60 years old, director of public relations of the Central Illinois Public Service Company who died in Springfield, Ill., was well known in Indianapolis. He was a resident of Indianapolis for many years and was public relations director for the Interstate Public Service Company. He left the company in 1929 for Springfield.

Funeral services were held in Indianapolis. He is survived by the widow and one son and three daughters.

E. E. WITHERBY

E. E. Witherby, Boston and New York representative of The Gas Machinery Company, Cleveland, Ohio, died suddenly at his home at Gray Rock, Dingley Island, Maine, on December 4th.

Mr. Witherby was associated with the gas business for a number of years. He is survived by his widow and two sons.

TRADE NEWS

Wm. M. Culbertson Heads Pipe Sales of International-Stacey

The International-Stacey Corporation who has recently become the distributor of Wheeling Steel Corporation's Seamless and Welded Line Pipe, Tubing, Casing, Drill Pipe, and other tubular products, has just announced the appointment of Wm. M. Culbertson in charge of oil country Tubular Products sales, with headquarters at Columbus, Ohio.

Mr. Culbertson was formerly connected with Wheeling Steel Corporation as special representative, prior to which time he was General Manager of Monongahela Tube Company at Pittsburgh, Pa., in charge of sales and mill operations.

Regulator Companies Unite

According to an official announcement just made public, the Mason Regulator Company has acquired the Neilan Company, Ltd., Los Angeles.

Mr. F. Kenneth Morrison, widely known in his capacity as sales manager of the Mason Regulator Co., states that "through the joining of the Mason and the Neilan companies we are now able to offer a broader and more useful service to every industry interested in efficient control of process and power operations.

Complete engineering, manufacturing, sales and service activities will be maintained in both Boston and Los Angeles. Mason-Neilan offices, manned by engineers thoroughly familiar with the consolidated line of control equipment, are now established at the following points: Boston (Mason Regulator Co., 1190 Adams St.); Los Angeles, (641-651 Santa Fe Avenue); New York, (19 Rector St., Mr. R. B. Werey in charge); Chicago (400 No. Michigan Ave., under the direction of Mr. Arthur J. Foley and Mr. William P. Gearon); Pittsburgh (1301 Clark Bldg., in charge of Mr. Bruce Irwin); Montreal (Mason Regulator Co. of Canada, Ltd., 686 Notre Dame St. West, under the direction of Mr. H. L. Peiler and Mr. M. F. Peiler).

Globe American Corp. to Introduce New Gas Range

The Globe American Corporation, Kokomo, Indiana, announces that it will soon introduce a new gas range which is promised to be revolutionary in performance and design. A single dial will automatically control the time and temperature of the cooking process and the correct B.T.U. input for each type of food which, according to Globe engineers, will make cooking results far more certain for the homemaker.

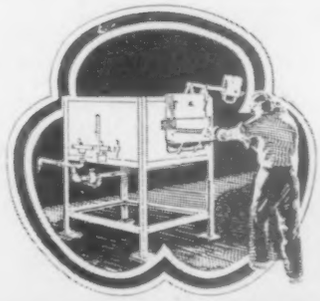
This new Globe range will be equipped with high efficiency burners which will work perfectly with either artificial or natural gas without a single part being changed. It is said that this unique invention will do away with the troublesome air mixer as none will be needed.

Several other unusual features which Globe American executives do not care to disclose are being incorporated into this new line of ranges. Models are being designed to fit into the different price levels. All of them will be completely insulated and fully enameled.

(Trade News continued on page 70)

ACCURATE...RAPID ...UNIFORM *Heating* with SC RATED FURNACES

When you place an SC Rated Furnace in a customer's plant you can be satisfied—sure—it will do the job intended economically—efficiently—without operating and production difficulties. SC Rated Furnaces are fired with SC Inspirator Burners. Heating is rapid and uniform—with single valve control and automatically maintained furnace atmosphere. The photograph below illustrates two large oven furnaces at the Sivyer Steel Casting Co., Milwaukee, Wisconsin. These furnaces are giving excellent results in the annealing, hardening, and drawing of steel and alloy castings. SC Rated Furnaces are available in large and small oven types, as well as high temperature furnaces, forge, rivet heating, pot hardening, and oil tempering units . . . to fit every heat treating need.



OPERATED BY HENRY L. DOHERTY & COMPANY

Surface Combustion

SURFACE COMBUSTION CORPORATION
TOLEDO, OHIO.

SALES AND ENGINEERING SERVICE
IN PRINCIPAL CITIES

Change Name from Philfuels to Philgas Company

A change of corporate name from Philfuels Company to Philgas Company was announced recently by G. G. Oberfell, president of the company, which is Phillips Petroleum's liquefied petroleum gas subsidiary.

"One division of our company deals direct with the public—marketing propane gas for homes beyond the gas lines under the tradename 'Philgas'. Hundreds of thousands of people have naturally called the organization 'Philgas Company', so we decided that it would be easier to change the name of our company than to attempt to get so many people to use the former corporate name," said Mr. Oberfell.

"There are no changes in financial interest, company policies, personnel, or location of offices," continued Mr. Oberfell, "just a new name for the same company."

Electrolux Hold Regional Sales Conference

Anticipating a greatly increased program of sales and sales promotion activity on gas refrigeration than ever before, members of the Middle West division of Electrolux Refrigerator Sales, Inc., recently concluded a six-day regional sales conference at the factory to discuss merchandising plans for 1932. The conference was the first of a series which will ultimately include all District Sales Engineers and Special Representatives.

As Chairman of the meeting, George L. Roach, Sales Manager, worked out an intensive schedule which covered every phase of sales effort and allied subjects. The first two days were confined to a study of the product and the major developments which have taken place within the past year. Discussions in this group were in charge of R. B. Moore, Service Promotion Manager, and Gene McDonald, School Instructor.

Next followed two days on sales promotion under the direction of H. S. Boyle, Sales Promotion Manager, who outlined the general program of field assistance. G. H. Schlatter, in charge of campaigns and sales plans, then covered the extent and scope of factory promotion. W. A. Rorison, editor of Electrolux Refrigerator News, closed the session with a talk on publications and departmental functions.

DeMers Appliance Company Formed

Mr. C. J. DeMers, Wilson, N. C., has established the DeMers Appliance Company for the sale of domestic gas appliances in Wilson, a city of 12,000 population. The city owns the utilities of Wilson but does not sell appliances. Mr. DeMers has been associated with gas utilities since 1920, having been commercial manager of some of them and is therefore well fitted to take over the sale of domestic gas appliances in Wilson.

MacRae Joins Pittsburgh Equitable Meter Sales Force

The Pittsburgh Equitable Meter Company announces the appointment of Mr.

J. R. MacRae

J. R. MacRae to its sales force. He comes to the Pittsburgh Equitable Meter Company from the Dallas, Texas, office of the Republic Steel Company. His wide experience in the sales organization of that company especially qualifies him for his new duties of selling both gas and water measuring and regulating equipment. Mr. MacRae will be located at the Dallas office.

Reliance Regulator and American Meter Interests Combine

Announcement has been made of the acquisition by American Meter Company of the Reliance Manufacturing Company and the Reliance Iron Works of Alhambra, California. A new Company is being formed under the name of Reliance Regulator Corporation to conduct these properties. The management of the former Reliance interests will be retained intact and no change in the present personnel of the Regulator Division are being contemplated. It is certain that Mr. Walter M. Thompson, President, and other Directors of the Former Reliance Companies, will be elected to the Board of Reliance Regulator Corporation, as well as the additional members who will represent the new interests.

American Meter Company manufactures a complete line of Displacement Meters, Orifice Meters, Rate Volume Controllers, as well as Gas and Meter Testing Apparatus for the Gas and Oil Industries. The Company is now in a position, through the Reliance Regulator Corporation, to add to its specialization in Gas Measurement the problems relating to Gas Regulation, which, with the growth in semi-high pressure distribution, have become more and more closely related.

McCurray Heads Timken Michigan Leak Clamp Division

Mr. F. A. McMurray, who was formerly Assistant to the President of the M. B. Skinner Company, has been appointed Sales Manager of the Leak Clamp Division of the Timken Michigan Company. His headquarters will be in Chicago, 1006 Burnham Building.

Mr. McMurray is a member of the American Gas Association and has for the last two years been a member of the Association's Pipe Joint Committee.

Having served the gas industry continuously for a period of twelve years, Mr. McMurray is thoroughly conversant with that industry's operations and needs. His wide experience, especially in distribution line practice, qualifies him to serve in an advisory capacity on problems incident to that phase of the gas company's operations.

His present duties will keep him in close contact with distribution engineers confronted with the problem of eliminating leaks in cast iron distribution mains.

The Timken Michigan Company are launching a new leak clamp with many interesting and individual features. Mr. McMurray's department will have charge of introducing this clamp into the industry.

George W. Moore Company Joins Link-Belt

The merger of the George W. Moore Company, of Chicago, with H. W. Caldwell & Son Company, a subsidiary of Link-Belt Company, is announced by Alfred Kauffmann, President, Link-Belt Company. The combined units are to be known as The Caldwell-Moore Division, Link-Belt Company.

Mr. Max H. Hurd, formerly President of the George W. Moore Company becomes a Vice-President of Link-Belt Company, in charge of the Caldwell-Moore operations. His headquarters will be at 2410 W. 18th Street, Chicago.

Thus the facilities of two well-known manufacturers of similar lines of conveying equipment are consolidated in the interest of better service to the jobber and consumer, and Link-Belt Company acquires an entirely new line of manufacture, Salem Elevator Buckets, an important specialty of the Moore Company.

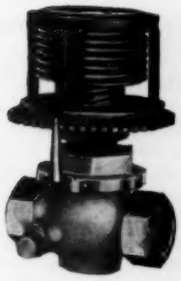
W. W. Hoopes Joints American Foundry & Furnace Co.

W. W. Hoopes has been appointed District Sales Manager in Ohio and adjacent territory for the Gas Division of the American Foundry & Furnace Co., Bloomington, Ill.

Mr. Hoopes was formerly with the Surface Combustion Co., of Toledo.

(Trade News continued on page 72)

Another ROBERTSHAW *Source of Extra Profit*



The ROBERTSHAW Space Heater THERMOSTAT

WHEREVER space heaters are used . . . either new or old . . . the Robertshaw Space Heater Thermostat will give you extra profits. It provides the economy of automatic control . . . just as essential in the gas fired space heater as in the gas range or the gas furnace.

The Robertshaw is small, compact, and attractively finished. Simple and durable, it is most easy to install at any time. And it is both automatic and ever dependable.

By adding this No. 2E Robertshaw to the space heater, the owner obtains that even, controlled heat which is such a vital safeguard of health and comfort. Be sure you know the attractive extra profits to be made with this much needed thermostat. Write today for the complete proposition.

ROBERTSHAW THERMOSTAT COMPANY
YOUNGWOOD, PENNA.

International-Stacey Corp. Complete Negotiations with Wheeling Steel Corp.

Confirmation has been received from the International-Stacey Corporation, Columbus, Ohio, and from the Wheeling Steel Corporation, Wheeling, W. Va., that arrangements have been completed for world wide distribution of Wheeling oil country tubular goods to the oil and gas industry, through the sales organization of The International Derrick & Equipment Division of International-Stacey Corporation. This rounds out Ideco's complete line of pumping and drilling material and comes as the result of negotiations during several months between officials of both companies. As rapidly as possible Ideco will establish stocks of Wheeling tubular goods, consisting of welded and seamless pipe, throughout the active oil and gas fields at strategic distributing centers. This arrangement does not disturb the identities of the two companies nor does it affect the existing distribution of Wheeling tubular goods through other channels.

The Wheeling line of welded and seamless oil country pipe includes A. P. I. and standard drill pipe, casing, tubing, line and drive pipe in a complete range of sizes and weights and thus enlarges the service of International-Stacey Corporation to the industry. For the refinery and pipe line companies, this arrangement immediately makes available Wheeling tubular goods in distributing centers close to their fields of activity.

Natural and Artificial Gas Utility companies will be supplied through the sales organization of the Stacey Gas Construction division of International-Stacey Corporation.

The Wheeling Steel Corporation and consolidated companies have long been identified with the oil and gas industry. Wheeling pipe is known to have been manufactured and sold throughout the country almost from the beginning of steel pipe manufacture.

Ralph Leavenworth Appointed Westinghouse Advertising Manager

Ralph Leavenworth has been appointed general advertising manager of the Westinghouse Electric and Manufacturing Company, according to an announcement made recently by J. S. Tritle, vice-president and general manager. He will have charge of all advertising and publicity activities of the company, the announcement reads, including the advertising division of the merchandising department, now centered in Mansfield, Ohio.

The business career of Mr. Leavenworth, prior to his association with the Westinghouse Company, has been one in which sales and advertising administrative work have been closely paralleled.

Graduating from Hamilton College, Clinton, N. Y., in 1914, he became associated with the Y. M. C. A., with headquarters in Cleveland and remained with that organization four years. After the war he joined the Standard Parts Company, also located in Cleveland, and except for a short period, during which he served as personnel director for a publishing firm, he was advertising manager of this concern, until 1923. In that year he became an account executive for Paul Teas, Inc., an industrial advertising agency. He remained with this firm six years becoming in that time part owner of the company.

January 1, 1930, he joined the Austin Company, of Cleveland, one of the world's largest engineering and building organizations, as assistant general sales manager. In this work he served in an executive capacity on sales, administrative and advertising work concerned with this international organization.

His appointment as general advertising manager of the Westinghouse Company followed. He will have his office in the East Pittsburgh headquarters of the company.

Dresser Manufacturing Form Canadian Company

S. R. Dresser Manufacturing Company, Bradford, Pa., recently announced the formation of Dresser Manufacturing Company, Limited, a Canadian Corporation with head offices at 32 Front Street, West, Toronto, Ontario. Mr. D. B. McWilliams is the Director in Charge of Sales.

New Partlow Bulletins

The Partlow Corporation, New Hartford, N. Y., have recently issued three new bulletins on their equipment. Bulletin No. 105 describes and illustrates the Partlow Automatic Gas Burning Equipment, which is readily adapted to any of the standard melting pots and can be quickly applied without interference with routine work. Dimensions and weights as well as blueprints are shown of the various pieces of equipment. Bulletin No. 205 covers Partlow Temperature Controls, illustrating and describing the different types of controls and instructions for installing and setting the same. Partlow Safety Gas Valves and Pilots is the title of Bulletin No. 305. Illustrations, instructions for operation and installation, sizes, weights and dimensions are given.

Copies of these bulletins may be obtained upon request.

New Torchweld Catalog

The Torchweld Equipment Co., Chicago, Ill. have just issued a new pocket size catalog describing and illustrating different styles of welding or cutting torches, units and gas pressure regulators. Line drawings are used to show construction and safety features of the equipment.

Among the new products described are small torches for aircraft, auto body and light sheet metal welding, also new city or natural gas and oxygen brazing torch.

Totten Appointed Sales Manager Tin Plate Division of Republic Steel

Mr. George E. Totten has been appointed Manager of Sales of the Tin Plate Division of Republic Steel Corporation with headquarters in the general offices of the corporation in Youngstown, Ohio, according to an announcement by Mr. N. J. Clarke, Vice President in Charge of Sales.

Reynolds Announce New Low Pressure Catalog

The Reynolds Gas Regulator Company, Anderson, Indiana, announces that their new Low Pressure Catalog is ready for distribution. Although this new book is devoted to Low Pressure Regulators, it does give in the last pages detailed information regarding automatic, quick-closing, anti-vacuum valves, for high or low pressure work. The new Catalog shows the complete line of Reynolds Low Pressure Regulators and gives complete information as to their uses. It also introduces the new Reynolds Midget and Double Valve Units. The Midget is recommended for installations such as: pilot lights, oil burners, etc. It is highly efficient where the consumption does not exceed 10 to 15 cu. ft. per hour. The Midget is especially desirable where the cost element is a vital factor. It is built in one pipe size (¼"), and is furnished in Spring Type adjustment. As this is just one of the Reynolds' Catalogs, it is punched for convenient handling along with those presenting the other Reynolds lines.

Leaflet on Fulton Duplex Gas Governor

A leaflet describing The Fulton Duplex Sensitive Gas Governor has been issued by The Chaplin-Fulton Mfg. Co., Pittsburgh, Pa. This regulator or governor is an improved form of the Duplex Sensitive Gas Governor, and is designed to meet the needs of artificial or natural gas companies.

Folder on Biological Cabinets

A new four-page folder, known as form EA-1131, illustrating and describing their new biological cabinet was recently issued by Electrolux Refrigerator Sales, Inc., Evansville, Ind. These cabinets are made in 4, 5, 6½, 8 and 10 cubic foot capacity, especially designed for druggists, doctors, hospitals and laboratories.

New Chaplin-Fulton Leaflet

The Chaplin-Fulton Mfg. Co., Pittsburgh, Pa., have issued leaflet No. 3289 describing and illustrating the Fulton Lever Safety Valves and Fulton Dead Weight Safety Valves.

(Trade News continued on page 74)

ELECTROLUX

is often the deciding factor in saving the cooking load

"Gas refrigeration helps us to prove that gas has a definite place in the modern home!" says Mr. M. A. Boylan, Vice-President in charge of Gas Refrigeration Sales, Scranton Spring Brook Water Co.

HE PROVES THAT GAS HAS A DEFINITE PLACE IN THE MODERN HOME. *Mr. M. A. Boylan, Vice-President of the Scranton Spring Brook Water Co., Scranton, Pa.*

A tiny gas flame takes the place of all moving parts

"WHILE the can-opener may play an important part in the preparation of the 'home-cooked' meal today, the preparation of the family meals still creates a sizable domestic load. Electrolux not only increases that load, but furnishes an additional reason for the original piping of the house with gas. It is this double influence that causes me to believe that the merchandising of gas refrigeration is well worth the attention of gas company officials."

* * *

Mr. Boylan's closing remark is a challenge to the gas industry. The selling of gas refrigerators is so closely tied up with the implanting in the public mind of the idea that gas is the modern up-to-date fuel, that any sales effort on refrigerators benefits the industry as a whole. Read between the lines of Mr. Boylan's message and you'll see "What are *you* doing about it?"

Electrolux has made it easy for you to "do something." Carefully worked out plans, catalogues and newspaper announcements are available for the asking. Just write to Electrolux Refrigerator Sales, Inc., Evansville, Indiana.

ELECTROLUX

THE *Gas* REFRIGERATOR

Groble Gas Regulator Company Announce New Catalogue

The new Groble house service regulator catalogue No. 5 just off the press contains comprehensive and valuable information on their complete line of service regulators for both high and low inlet pressure. A copy will be mailed promptly on request.

Homestead Valve Reference Book

An entirely new and more complete reference book on valves has just been issued by Homestead Valve Manufacturing Company. A copy of this useful 8½" x 11", forty-eight page book may be had upon request sent to the factory at Coraopolis, Pa., or to one of their representatives located in all principal cities.

Foxboro Saturation Control Bulletin

A sixteen page bulletin No. 179 on Gas Saturation Control recently issued by the Foxboro Company of Foxboro, Mass., contains a discussion of the problems encountered in the process of saturating natural gas.

This bulletin contains the computations involved in the determination of the relative humidity of any gas. It is claimed these computations prove that the correct per cent saturation in gas cannot be determined from an air humidity table. Because of this fact, Foxboro Engineers have designed, and present to the gas industry a Universal Relative Humidity Nomograph for determining the per cent saturation or relative humidity of any gas. This chart is included in the bulletin.

Complete information on the Foxboro Gas Saturation Controller together with facsimile records are given. Copies will be sent on request.

New Bulletin on Valves

A 16-page book recently issued by the Reading-Pratt & Cady Company, Bridgeport, Connecticut, gives a complete description of the new Lubrotite Gate Valve with its uses. It is claimed this valve differs from the ordinary gate valve in that it has a unique duct system for introducing a lubricant-seal between the seating surfaces. This results in tight seating even though the seats of the valve become injured in service, retards corrosion, and gives easier valve operation.

Ingersoll-Rand Issues New Catalog

Ingersoll-Rand Co., 11 Broadway, New York, has issued a new 20-page, illustrated catalogue, Form No. 4364, on paving breakers and pile drivers for sheet piling. It describes four sizes of paving breakers, two of which, the 37-pound L-54 and the 80-pound R-63, have been added to the line in recent months. It also contains material on two new pile drivers, the R-63 and the R-30.

Bulletin on Lattner Flueless Boiler

P. M. Lattner Manufacturing Company, Cedar Rapids, Iowa, have just issued bulletin No. 134 which fully describes and illustrates the new Lattner high efficiency flueless boiler. These boilers are built in five standard sizes ranging from 1½ h.p. inclusive.

New Bristol Catalog

Bristol's Free Vane and Air Operated Recorder Controller is fully described in a 24 page Catalog No. 4001 just issued by the Bristol Company, Waterbury, Conn. This catalog explains the principle of operation of the controllers and contains many illustrations.

New Armco Culvert Catalog

A new catalog, "The Armco Jacking Method," has just been issued by the Armco Culvert Manufacturers Association, Middletown, Ohio. This catalog describes the Armco jacking method to install conduits, drainage openings, and passageways under streets, highways and railroads. Copy of the bulletin will be sent upon request.

New Bulletin on National Gas Odorization System

The Pacific Pipe & Supply Company's latest bulletin, No-O-2, has been published with complete and definite description and prices of the Rapico Natural Gas Odorization System.

Odorization by this system is directly proportional to the rate of flow being governed by the differential in pressure across an orifice. An odorant flow chart is given in the bulletin as well as line drawings of the completely assembled system.

Copies may be obtained by writing the Pacific Pipe & Supply Company, 1002 Santa Fe Avenue, Los Angeles, California.

Homestead Valve Appoint Representatives

Chatard and Norris, 218 Water Street, Baltimore, Md., have just been appointed as exclusive representatives of Homestead Valve Manufacturing Company for the Eastern part of Maryland and the District of Columbia.

C-E Multiple Circulation Boiler

Combustion Engineering Corporation, 200 Madison Avenue, New York, has just issued a pamphlet describing the C-E Multiple Circulation Boiler. This boiler is designed to provide the positive and unrestricted circulation which is so important, in modern boiler practice with its high steam pressures, high temperatures and high rates of evaporation.

The C-E Multiple Circulation boiler is a departure from the conventional design of bent tube boilers in two essentials—tube arrangement and steam liberation.

This boiler is available in sizes ranging from 2,000 sq. ft. to 26,000 sq. ft. of heating surface. It is adaptable to any type of firing and may be set double.

The pamphlet contains table of specifications covering the four types in which this boiler is manufactured—4 Pages—8½ x 11.

Worthington Pump & Machinery Release New Catalogs

The Worthington Pump & Machinery Corporation, Harrison, N. J., have recently issued the following new catalogs, bulletins, etc.

Horizontal Duplex Piston Pattern Oil Pumps, Type S.P. Maximum working pressure: Steam end, 150 lb.; liquid end, Wompco, 750 lb., cast steel, 1500 lb. Specification sheet W-112-S10 4 pages.

Power Pumps, vertical triplex single-acting, instructions and parts lists. Specification Sheet D-423-E8, 2 pages.

Horizontal Duplex Piston Pattern Heavy Pressure Hot Oil Pumps, Type S.P. For hot feed or hot flash service at temperatures up to 700° F. Specification Sheet W-112-S11, 4 pages.

Surface Condenser, patented folded tube layer type. For turbo-generator with turbine-driven circulating pump, steam-air ejector as air removal apparatus, and motor-driven hotwell pump. Specification Sheet W-200-S10, 4 pages.

If desired, a copy of any of the above will be sent upon application to the Publicity Department, Harrison, N. J.

Beaver Pipe Tool Catalog

The Borden Company, Warren, Ohio, have issued a new condensed 8 page catalog, No. 32, on The Beaver line of pipe tools. It contains complete descriptions and illustrations of their products, as well as list prices.

Series of Booklets

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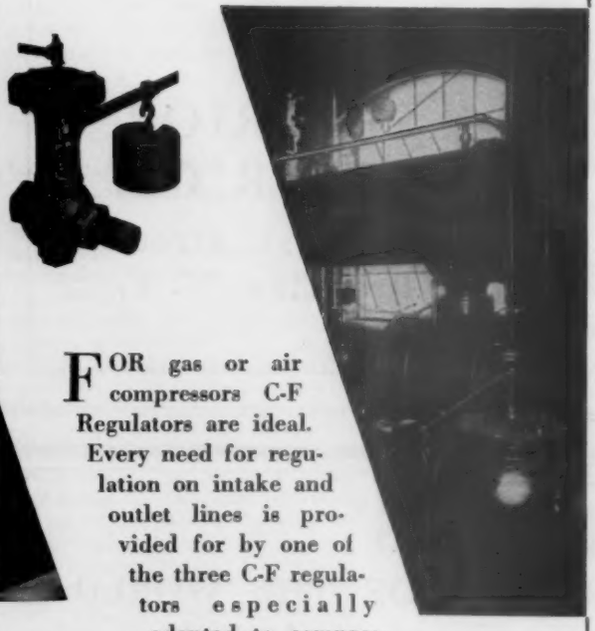

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Republic Steel Corpn. 626
"AMERICAN" GAS AND METER TESTING APPARATUS
American Meter Co. 320
AUTOMATIC GOVERNORS
Connelly Iron Sponge & Governor Co. 289
BALANCE GOVERNORS
Connelly Iron Sponge & Governor Co. 290
BACK PRESSURE VALVES
Connelly Iron Sponge & Governor Co. 295
BECKER TYPE COMBUSTION COKE & GAS OVENS
The Koppers Construction Co. 235
BECKER TYPE BY-PRODUCT COKE AND GAS PLANTS
The Koppers Construction Co. 477
B. H. CO. OSCILLATING CONTINUOUS FILTER
Bartlett Hayward Co. 701
B. H. CO. EMICARNER
The Bartlett Hayward Co. 56
B. H. CO. VERTICAL SCRUBBER
The Bartlett Hayward Co. 57
BLAST GATE
Western Gas Construction Co. 580
BOILER FEED PUMPS
P. M. Lattner Mfg. Co. 478
"BULLETS"—HOLDERS
Stacey Bros. Gas Construction Co. 516
BUTTERFLY VALVES
Western Gas Construction Co. 450
BUTANE PLANT EQUIPMENT
Philfuels Co. 510
BUTANE GAS PLANT CONTROL
Cutler Hammer, Inc. 631
CALORIMETRY
American Meter Co. 321
CALOROPTIC, THE
Connelly Iron Sponge & Governor Co. 511
CHEMICAL ANALYSIS OF GAS PURIFYING MATERIALS
E. J. Lavino & Co. 455
CHEMISTRY AND PHYSICS OF THE COMBUSTION OF GASEOUS FUELS
E. J. Lavino & Co. 456
COAL PRODUCTS TREE
The Koppers Construction Co. 234
COKE FIRED GAS PRODUCER OPERATION
The Koppers Construction Co. 236
CONNELLY COMBINATION VALVE
Connelly Iron Sponge & Governor Co. 610
CONTINUOUS VERTICAL COMBINATION OVENS
The Koppers Construction Company 238
CONTROL MECHANICAL APPARATUS
Western Gas Construction Co. 581
COOPER-BESSEMER NEW TYPE COMPRESSOR UNIT
Cooper-Bessemer Co. 517
COOPER-BESSEMER VERTICAL GAS ENGINES
Cooper-Bessemer Co. 518
COOPER-BESSEMER GAS AND OIL ENGINES
Cooper-Bessemer Co. 519
COOPER COMPRESSOR UNIT
Cooper Bessemer Co. 520
CORRUGATED TRANSITE
Johns-Manville 601
COUNTER BALANCE MANHOLES
Connelly Iron Sponge & Governor Co. 299
DECOMPOSITION METERS
Western Gas Construction Co. 582
DE FLOREZ REMOTE MANUAL CONTROL SYSTEM
Brown Instrument Co. 452
DEHYDRATION OF MANUFACTURED GAS
Western Gas Construction Co. 583
The Koppers Construction Co. 237
DISTRICT L. C. GOVERNORS
Connelly Iron Sponge & Governor Co. 293
DR. OTT-LUX-GAS TESTER
The Alpha Lux Co., Inc. 23
DUPLEX VALVES
Andale Co. 45
FAST'S FLEXIBLE COUPLING
The Bartlett Hayward Co 54
FORGED STEEL GATE VALVES
Darling Valve & Mfg. Co 20
FULTON DEAD WEIGHT SAFETY VALVES
Chaplin-Fulton Mfg. Co. 480
FULTON LEVER SAFETY VALVES
Chaplin-Fulton Mfg. Co. 479
GAS CONDENSERS
Isbell Porter Co. 140
GAS COOLER
Andale Co 46
GAS DISTRIBUTION
The U. G. I. Contracting Co. 652
GAS ENGINE DRIVEN COMPRESSOR UNITS
Cooper-Bessemer Corpn. 503
GAS FILTERS
American Meter Co. 322
GAS PURIFICATION PROCESS
Western Gas Construction Co. 585
GAS HOLDERS—HIGH AND LOW PRESSURE
Stacey Mfg. Co. 579
GAS MEASUREMENT
American Meter Co. 323
GATE VALVES
Western Gas Construction Co. 586
GAS WORKS APPARATUS AND EQUIPMENT
Connelly Iron Sponge & Governor Co. 627
HAND COLORIMETER
The Alpha Lux Co. Inc. 22
HIGH EFFICIENCY GAS CONDENSERS
Isbell Porter Co. 137
HIGH PRESSURE TOWER
Western Gas Construction Co. 587
HOWARD CHARGER
The Western Gas Construction Co. 37
HIGH TEST WELDING ROD
Union Carbide & Carbon Corpn. 255
HIGH PRESSURE GAS HOLDERS
Western Gas Construction Co. 590
JET PHOTOMETERS
Connelly Iron Sponge & Governor Co. 298
JOHNS-MANVILL SERVICE TO THE POWER PLANT
Johns-Manville 602
KEEPING UP WITH INDUSTRY
Cruse Kemper Co. 457
KENNEDY AUTOMATIC CONTROL
The Bartlett Hayward Co. 59
KOPPERS COMPANY'S COAL GAS PLANTS, THE
The Koppers Construction Co. 240
LABORATORY APPARATUS
American Meter Co. 324
Superior Meter Co. 521
LIQUID PURIFICATION
The Western Gas Construction Co. 83
LUX RECORDING GAUGE
The Alpha Lux Co., Inc. 21
MACKENZIE EXHAUSTERS
Isbell Porter Co. 653
MANUAL OF DRY BOX PURIFICATION
E. J. Lavino and Co. 274
MERCURY SEAL GOVERNORS
Connelly Iron Sponge & Governor Co. 291
METERS, GAS
American Meter Co. 326
Superior Meter Co. 522
Roots-Connersville-Wilbraham —
International Stacey Corpn. 702
"METRIC" IRONCASE METERS
American Meter Co. 325
MITCHELL ELECTRIC VIBRATING SCREENS
C. W. Hunt Co., Inc. 229
NAPHTHALENE ABSORPTION PLANTS
The Western Gas Construction Co. 84
NEW APPARATUS FOR THE REMOVAL OF NAPHTHALENE AND GUM FORMING CONSTITUENTS FROM GAS
The Koppers Construction Co. 654
NEW AND IMPROVED COOPER GAS ENGINE COMPRESSOR
Cooper Bessemer Corpn. 523

(Continued on page 78)

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TRADE CATALOGS

(Continued from page 76)

NEW METHOD OF GAS PURIFICATION
The Koppers Construction Co. 241
OBSERVATION ON LUX-MATERIAL
The Alpha Lux Co., Inc. 24
ORIFICE METERS
American Meter Co. 327
PIPE—TONCAN IRON
Republic Steel Corp. 454
PRESSURE GAUGES
Connelly Iron Sponge & Governor Co. 296
American Meter Co. 378
Superior Meter Co. 525
PRESSURE VACUUM RELIEF VALVE FOR STORAGE TANKS
International-Stacey Corpn. 642
PURIFICATION OF OPEN HEARTH FUEL GAS, THE
The Koppers Construction Co. 239
PURIFICATION OF NATURAL GAS & REFINERY GASES FROM HYDROGEN SULPHIDE
Western Gas Construction Co. 588
RELIANCE SERVICE REGULATORS
Isbell Porter Co. 139
ROADLESS BARROWS
Isbell Porter Co. 655
ROTARY SELF-CLEANING STRAINER
Andale Co. 656
SECTIONAL SIDE-WALL CONSTRUCTION
International-Stacey Corpn. 643
SERVICE CLEANERS
American Meter Co. 657
Superior Meter Co. 521
SERVICE GOVERNORS
Governor Co. 658
SERVICE D. C. GOVERNORS
Connelly Iron Sponge & Governor Co. 294
SHAVING SCRUBBERS
Isbell Porter Co. 138
SHEET IRON A PRIMER
Republic Steel Corpn. 628
SMOOT CONTROL OF COMBUSTION AS APPLIED TO TRAVELING GRATE STOKERS
Smoot Engineering Corpn. 659
SMOOT CONTROL AS APPLIED TO UNDERFEED STOKERS
Smoot Engineering Corpn. 660
SMOOT CONTROL AS APPLIED TO WATER GAS SETS
Smoot Engineering Corpn. 661
SMOOT STEAM ACCUMULATOR AND CONTROL SYSTEM
Smoot Engineering Corpn. 66
SPECIFICATIONS ON HIGH AND LOW PRESSURE HOLDERS
The Stacey Bros. Gas Constrn. Co. 74
"STACEY BULLET"
The Stacey Bros. Gas Constrn. Co. 73
STACEY-KLONNE DRY GAS HOLDERS
Stacey Bros. Constrn. Co. 644
STANDARD HOLDERS FOR LOW PRESSURE STORAGE
Western Gas Construction Co. 580
STANDARD STEEL BUILDINGS
International-Stacey Corpn. 645
STEEL DERRICKS AND ACCESSORIES
International-Stacey Corpn. 646
STREET DEPARTMENT TOOLS
Connelly Iron Sponge & Governor Co 297
STREET MAIN GOVERNORS
Isbell Porter Co. 134
THROTTLE GOVERNORS & COMPENSATORS
Isbell Porter Co. 662
U. G. I. BARRING DOWN MACHINE, THE
The U. G. I. Contracting Co. 663
U. G. I. INTERMITTENT CHAMBER OVENS
The U. G. I. Contracting Co. 75
U. G. I. MECHANICAL GENERATOR AND CHARGER, THE
The U. G. I. Contracting Co. 79
U. G. I. MODEL "B" AUTOMATIC CONTROL, THE
The U. G. I. Contracting Co. 71
VALVES
The Western Gas Construction Co. 86
VALVES & SPECIALS
Isbell Porter Co. 144
VALVES
Darling Valve & Mfg. Co. 33
VERTICAL GAS ENGINES
Cooper-Bessemer Corpn. 504
WATER GAS
The Western Gas Construction Co. 89
WATERLESS GAS HOLDERS
The Bartlett Haynard Co. 58
WEST GAS
West Gas Improvement Co. 175
PUMPS FOR GAS PLANTS
Geo. D. Roper Corpn. 481
R-C-W STANDARD DUTY GAS PUMPS
Roots-Connersville-Wilbraham 636
ROTARY DISPLACEMENT METERS
Roots-Connersville-Wilbraham 59
R-C-W HEAVY DUTY GAS PUMPS
Roots-Connersville-Wilbraham 647
STANDARD HOLDERS FOR LOW PRESSURE STORAGE
Stacey Mfg. Co. 424
HIGH PRESSURE GAS HOLDERS
Stacey Mfg. Co. 425

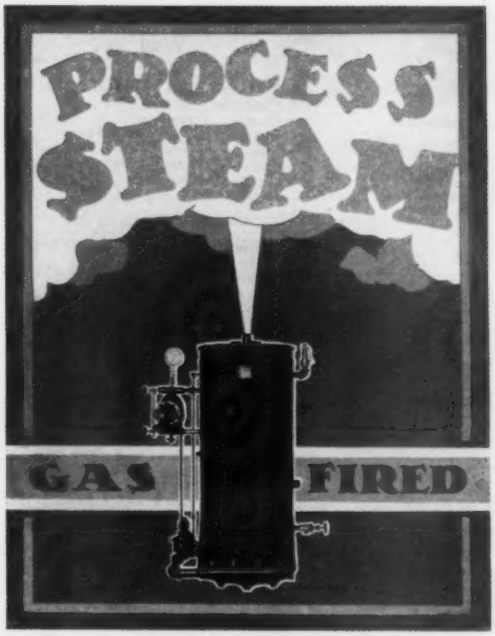
INSTRUMENTS

BRISTOL'S AIR OPERATED CONTROLLERS
The Bristol Co. 122
BRISTOL'S AUTOMATIC ELECTRIC CONTROL VALVES
The Bristol Co. 126
BROWN AUTOMATIC TEMPERATURE CONTROL CATALOG
The Brown Instrument Co. 166
BROWN ELECTRIC FLOW METER CATALOG
The Brown Instrument Co. 170
BROWN REMOTE TYPE INSTRUMENTS
Brown Instrument Co. 427
BRISTOL AUTOMATIC TEMPERATURE CONTROL CATALOG ON GAS FIRED BAKING OVEN
Bristol Co. 498
BRISTOL'S LONG DISTANCE TRANSMITTING GAUGES
The Bristol Co. 129
BRISTOL'S PYROMETERS
The Bristol Co. 130
BROWN PYROMETER CATALOG
The Brown Instrument Co. 171
BRISTOLS PYROMETER CONTROLLERS
The Bristol Co. 123
BRISTOLS RECORDING BAROMETERS
The Bristol Co. 125
BRISTOL'S RECORDING LIQUID LEVEL GAUGES
The Bristol Co. 128
BRISTOL'S RECORDING MILLIVOLTMETERS FOR ELECTROLYSIS SURVEYS
The Bristol Co. 664
BRISTOL'S RECORDING PRESSURE & VACUUM GAUGES
The Bristol Company 132
BRISTOL RECORDING PSYCHROMETERS
The Bristol Co. 308
BRISTOL'S TEMPERATURE CONTROLLERS
The Bristol Co. 124
BRISTOL'S RECORDING THERMOMETERS
The Bristol Company 665
THE ERA OF AUTOMATIC CONTROL
Brown Instrument Co. 502
"GOOD FURNACES—GOOD MEN—YET WE'RE SUNK ON OUR HEAT TREATING COSTS"
Brown Instrument Co. 550
MEETING YOUR IDEAS ON THE FLOW PROBLEM
The Brown Instrument Co. 164
PARTLOW TEMPERATURE CONTROLS
Partlow Corpn. 482
PRESSURE GAUGE CATALOG
The Brown Instrument Co. 169
RECORDING DEMAND FOR GAS METERS
American Meter Co. 330
RECORDING THERMOMETERS CATALOG
The Brown Instrument Co. 168
RESISTANCE THERMOMETERS CATALOG
The Brown Instrument Co. 167
TYCOS INSTRUMENTS FOR GAS PLANTS
Taylor Instrument Companies 542

REGULATORS

AUTOMATIC GAS BURNING EQUIPMENT
Partlow Corpn. 470
AUTOMATIC TEMPERATURE CONTROLS
Partlow Corpn. 471
AUTOMATIC TEMPERATURE INDICATING CONTACTOR
Partlow Corpn. 472
AUTOMATIC TRUCK-CLOSING ANTI-VACUUM VALVE
Reynolds Gas Regulator Co. 282

(Continued on page 80)



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(Continued from page 78)

BARBER SUPERIOR GAS PRESSURE REGULATORS
The Barber Gas Burner Co. 604
BOTTLED GAS AN ALLY OF THE GAS INDUSTRY
Sprague Meter Co. 306
FULTON GAS FUEL BOILER GOVERNOR
The Chaplin Fulton Mfg. Co. 248
FULTON GAS REGULATOR CATALOGUE
The Chaplin Fulton Mfg. Co. 247
HIGH PRESSURE LINE REGULATORS AND HIGH PRESSURE RELIEF VALVES
Reynolds Gas Regulator Co. 278
HIGH PRESSURE SERVICE REGULATORS
Reynolds Gas Regulator Co. 279
HOUSE SERVICE REGULATORS
Groble Gas Regulator Co. 703
LINOTYPE AND MONOTYPE TEMPERATURE CONTROL
Partlow Corpn. 473
LITTLE GIANT HOUSE REGULATOR
Reynolds Gas Regulator Co. 283
LOW PRESSURE SERVICE REGULATORS
Reynolds Gas Regulator Co. 281
METAL MELTING POT TEMPERATURE CONTROL CIRCULAR
Partlow Corpn. 474
METER HANGER CATALOG
Mueller Co. 2
PERFORMANCE IS PROOF
Groble Gas Regulator Co. 175
POCKET HAND BOOK—DIRECTIONS FOR SETTING AND OPERATING FULTON GAS REGULATORS
The Chaplin Fulton Mfg. Co. 249
REGULATOR CATALOG
Mueller Co. 3
REGULATOR CATALOG
Reynolds Gas Regulator Co. 37
REGULATORS FOR HIGH & MEDIUM PRESSURES
Sprague Meter Co. 225
RELIANCE BALANCE VALVE DISTRICT REGULATOR
Isbell Porter Co. 134
SINGLE DISTRICT & DOUBLE DISTRICT REGULATORS
Isbell Porter Co. 666
Reynolds Gas Regulator Co. 280
SAFETY GAS VALVE AND PILOT WITH LOW WATER SHUT OFF
Partlow Corpn. 475
SINGLE- DOUBLE- AND QUADRUPLET SAFETY GAS VALVE AND PILOT
Partlow Corpn. 476
FULTON HOUSE REGULATOR
FULTON SPRING REGULATOR
FULTON VACUUM RELIEF VALVES
FULTON DIFFERENTIAL RELIEF VALVES
FULTON DIFFERENTIAL REGULATORS
FULTON DIFFERENTIAL GAS RELIEF VALVES
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FULTON LOW PRESSURE REGULATORS
FULTON CUTOUT LATCH REGULATOR
FULTON DEAD WEIGHT REGULATOR
FULTON DUPLEX SENSITIVE GAS GOVERNOR
The Chaplin Fulton Mfg. Co. 611

REFRACTORIES

CEMENTING JAMP JOINTS
Quigley Company 159
CHOOSING A HIGH TEMPERATURE CEMENT
HIGH TEMPERATURE CEMENT IN THE GAS PLANT
Quigley Company 158
HOT PATCHING RETORTS
Quigley Company 160
HYTEMPITE IN THE GAS PLANT
Quigley Company 163
HYTEMPITE IN THE POWER PLANT
Quigley Company 408
PROTECT YOUR PLANT & EQUIPMENT —A PROTECTIVE COATING
Quigley Company 161
PROPERTIES AND USES OF KROMEPATCH
E. J. Lavino & Co. 458
QUICK CARBURETOR REPAIRS MADE HYTEMPITE
Quigley Company 157
QUIGLEY REFRACTORY GUN, THE
Quigley Company 162
QUIGLEY ACID PROOF CEMENT
Quigley Company 310

PIPE

AUTOGENOUS WELDING OF NATIONAL PIPE
National Tube Co. 411
BELL & SPIGOT REPAIR CLAMPS
S. R. Dresser Mfg. Co. 612
CAST IRON PIPE
United States Cast Iron Pipe & Foundry Co. 149
CAST IRON PIPE & FITTINGS
McWane Cast Iron Pipe Co. 203
COUPLINGS AND SPECIALTIES FOR NATURAL GAS
S. R. Dresser Mfg. Co. 43
COUPLINGS FOR MANUFACTURED GAS MAINS
S. R. Dresser Mfg. Co. 42
COUPLINGS FOR PLAIN END PIPE
S. R. Dresser Mfg. Co. 613
FOR EVERY JOINT ON THE LINE
Victaulic Co. of Amer. 13
WESTLING VALVE
Bartlett Hayward Co. 275
WOODALL-DUCKHAM VERTICAL RETORTS
Isbell Porter Co. 141
PIPE CATALOG, GENERAL
McWane Cast Iron Pipe Co. 483
SMALL PIPE CATALOG
McWane Cast Iron Pipe Co. 484
HANDBOOK OF CAST IRON PIPE (DISTRIBUTED TO GAS OFFICIALS AND ENGINEERS ONLY)
Cast Iron Pipe Research Assn. 178
HANDBOOK OF CAST IRON PIPE FOR GAS SERVICE
United States Cast Iron Pipe & Foundry Co. 148
HANDBOOK OF DE LAVAUD CENTRIFUGALLY CAST IRON PIPE
United States Cast Iron Pipe and Foundry Co. 667
SAFEGUARDING YOUR PIPE LINE INVESTMENT
Johns Manville
SEMET SOLVAY PIPING AND VALVES
Semet Solvay Engineering Corpn. 614
TONCAN IRON PIPE FOR PERMANENCE
Republic Steel Corpn. 629

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Roots-Connersville-Wilbraham 641
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Victaulic Co. 499
PIPE COUPLINGS
Victaulic Co. of Amer. 668
STEEL PIPE COUPLINGS
S. R. Dresser Mfg. Co. 669
STEEL DEPARTMENT SUPPLIES
Safety Gas Main Stopper Co. 670
HIGH TEST WELDING ROD
The Linde Air Products Co. 81
JOINT SEALING COMPOUND
Quigley Company, Inc. 485
LONG PIPE LINES WITH OXWELDED JOINTS
The Linde Air Products Co. 81
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The Linde Air Products Co. 671
OXY-ACETYLENE TIPS
The Linde Air Products Co. 672

(Continued on page 82)

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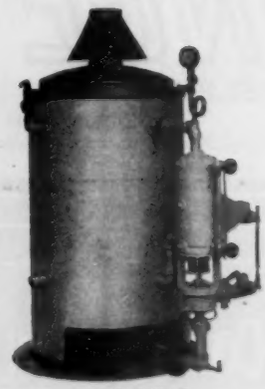

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Continued from page 80)

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Pittsburgh Equitable Meter Co. 674
MONEL WET TYPE METERS
Superior Meter Co. 223
INSTRUCTIONS FOR CONNERSVILLE TANDEM METERS
The Connersville Blower Co. 337
INSTRUCTION FOR THE INSTALLATION AND OPERATION OF CONNERSVILLE ROTARY DISPLACEMENT METERS
Connersville Blower Co. 341
&NSTRUCTIONS FOR THE MAXIMUM DEMAND RECORDER
The Connersville Blower Co. 336
INSTRUCTIONS FOR THE USE OF THE P. V. T. T. RECORDING GAUGE
The Connersville Blower Co. 342
IRONCLAD CAST IRON DRY GAS METER
Pittsburgh Equitable Meter Co. 264
DREADNAUGHT TYPE METERS
Sprague Meter Co. 227
GAS METERS AND APPARATUS
Lambert Meter Co., Inc. 173
American Meter Co. 338
Superior Meter Co. 527
INSTRUCTIONS FOR THE PROVING AND TESTING OF METERS
American Meter Co. 120
Superior Meter Co. 528
LINDERMAN LARGE VOLUME GAS METERS
American Meter Co. 330
METER CATALOG
American Meter Co. 121
METERS AND DIAPHRAGMS
Superior Meter Co. 224
"METRIC" FLOW METERS
American Meter Co. 343
RECORDING DEMAND FLOWMETER
Lambert Meter Co. 675
DEMAND GAS METERS
Bulletin 13—Sprague Meter Co. 305
"WESTCOTT" ORIFICE METERS
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Sprague Meter Co. 488
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Cleveland Trencher Co. 417
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American Lava Corpn. 486
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P. M. Lattner Mfg. Co. 287
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Bruce McDonald Co. 39
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Robertshaw Thermostat Co. 418
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Robertshaw Thermostat Co. 420
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Johnson Gas Appliance Co. 554
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SAFETY GAS VALVES FOR INDUSTRIAL FURNACES, OVENS AND POTS
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TEMPERATURE CONTROLS
The Partlow Corpn. 651

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(Continued on page 84)

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(Continued from page 82)

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CONVERSION BURNERS FOR ALL FURNACES AND BOILERS
Barber Gas Burner Co. 469

FOR SECTIONAL BOILERS
Robert-Gordon Appliance Corp.

HOMESTEAD FIRES
The Homestead Heater Co. 19

HOUSE HEATING DATA BOOK
Roberts-Gordon Appliance Corp. 340

HOUSE HEATING CATALOG
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IDEAL GAS BOILER HANDBOOK
American Gas Products Corpn. 243

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Johnson Gas Appliance Co. 532

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Geo. D. Rober Corpn 491

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RANGES

THE CAREFREE HOSTESS
American Stove Co. 252

SUNDAY DINNER
American Stove Co. 251

THE SECRET OF HAPPY HOMES
American Stove Co. 250

GAS RANGES
American Stove Co. 253

ADVERTISING MANUAL
George D. Roper Co. 48

MERCHANDISING GAS APPLIANCES TO THE HOUSEWIFE
Geo. D. Roper Corpn. 49

RANGE CATALOG
Geo. D. Roper Corpn. 51

RANGE CATALOG
New Process Stove Co. 260

RANGE CATALOG
Dangler Stove Co. 261

RANGE CATALOG—ORIOLE GAS RANGES
Standard Gas Equipment Corpn. 346

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RANGE CATALOG—ACORN GAS RANGES
Standard Gas Equipment Corpn. 348

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Spencer Thermostat Co. 406

THERMOLATOR OVEN HEAT CONTROL
Milwaukee Gas Specialty Company 638

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SECRET OF SILENCE IN REFRIGERATION
Electrolux Refrigerator Sales, Inc. 301

WATER HEATING

THE UTILITY

CONSTANT HOT WATER
Welsbach Co. 72

KOMPAK BOOK
Kompak Co. 263

WARM FRIENDS (RADIANT GAS HEATERS)
Welsbach Co. 71

PAINT

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Quigley Company 345

TECHNICAL PAINTS
Cheesman-Elliot Co., Inc. 553

PROTECT AND DECORATE
Quigley Furnace Specialties Co. 407

MISCELLANEOUS

ALCO CARBIDE GAS BURNERS, FIXTURES AND LIGHTING ACCESSORIES
American Lava Corpn. 36

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Cast Iron Pipe Research Ass'n 6-7
Chace Valve Co., W. M. 84
Chaplin-Fulton Mfg. Co. 76
Cleveland Trencher Co., The 15
Connelly Iron Sponge & Governor Co. 83
Connersville Blower Co. 11
Cruse-Kemper Co. 4

Darling Valve & Mfg. Co. 18
Dresser, S. R., Mfg. Co. 10

Electrolux Refrigerator Sales, Inc. 73

Gas Engineering Co. 83
Gas Machinery Co. 83
Gas Purifying Materials Co. 79
General Gas Light Co. 67
Grand Rapids Loose Leaf Binder Co. 83
Groble Gas Regulator Co. 80

Homestead Heater Co. 83

Improvement Equipment-Russell Engr. Co. ... 81
International-Stacey Corp. 11
Isbell Porter Co. 81

Johnson Gas Appliance Co. 81
Johns-Manville 20

Kompak Company 13

Lambert Meter Co. 79
Lattner Mfg. Co., P. M. 82
Lavino & Co., E. J. 81
Linde Air Products Co. 9

McClintic-Marshall Co. 80
McWane Cast Iron Pipe Co. 21
Mears-Kane-Ofeldt, Inc. 79
Mohawk Asphalt Heater Co. 83

National Tube Company 65
New York City Cancer Committee 86

Philgas Company 8
Pittsburgh Equitable Meter Co. 12
Precision Thermometer & Instrument Co 75

Quigley Co. 78

Reynolds Gas Regulator Co. 19
Roberts-Gordon Appliance Corp. 77
Robertshaw Thermostat Co. 71
Roots Co., P. H. & F. M. 11

Safety Gas Main Stopper Co. 78
Semet-Solvay Engineering Co. 5
Sprague Meter Co. .....Front Cover
Stacey Bros. Gas Construction Co. 11
Superior Meter Co. 75
Surface Combustion Corporation 69
Stacey Manufacturing Co., The 11

Unger, John S. 83
Union Carbide & Carbon Corp. 9
United Engineers & Constructors, Inc. 2
United States Pipe & Foundry Co. ....Fourth Cover

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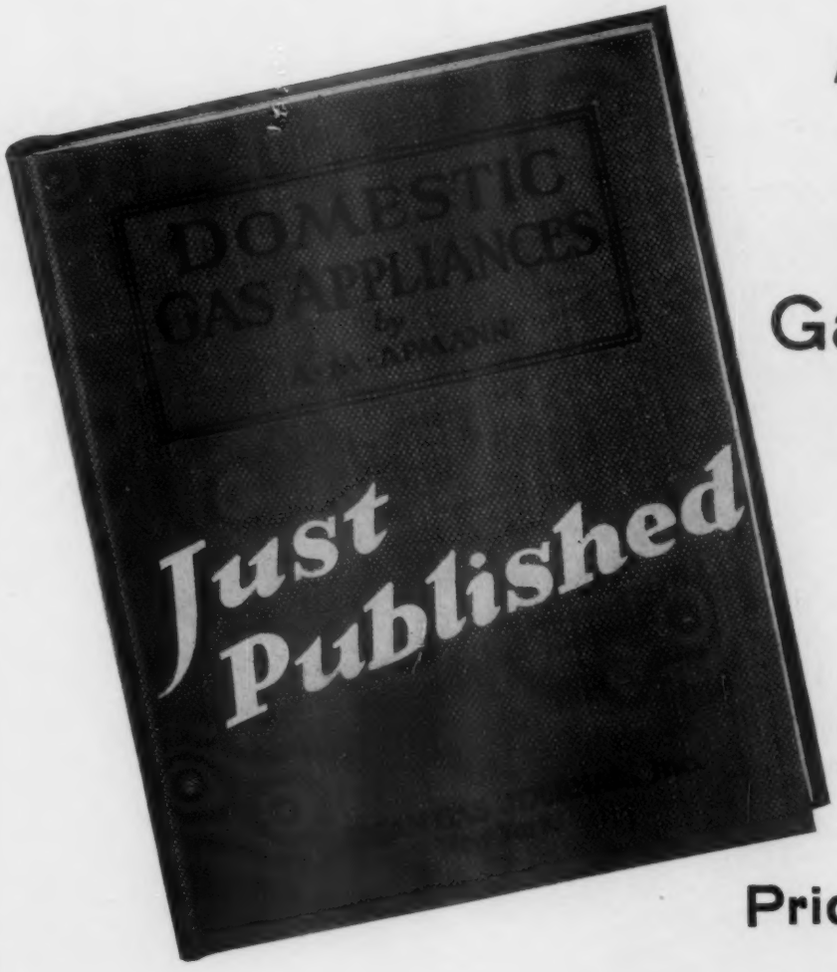

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